July 1983

An independent magazine published by ECC Publications

sinclair user

75p

Issue No 16

NEW AWARD — THOUSANDS OF £££s IN PRIZES

STORAGE PROBLEMS? — OPEN OUR FILE ON THE RAMPACKS



Find the female angle on the ZX-81

Make sweet music from the BEEP

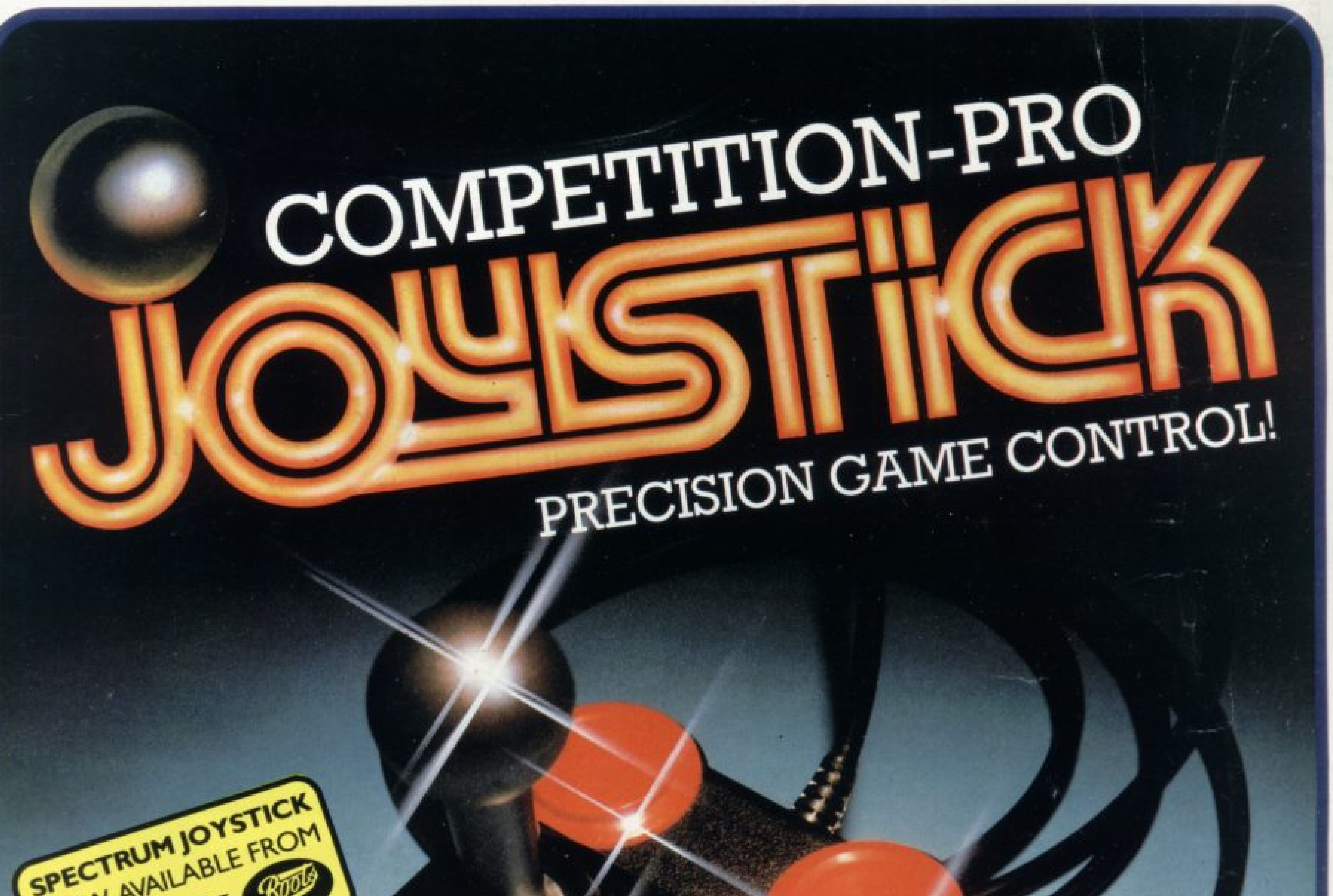
Early launch of Microdrives pledged

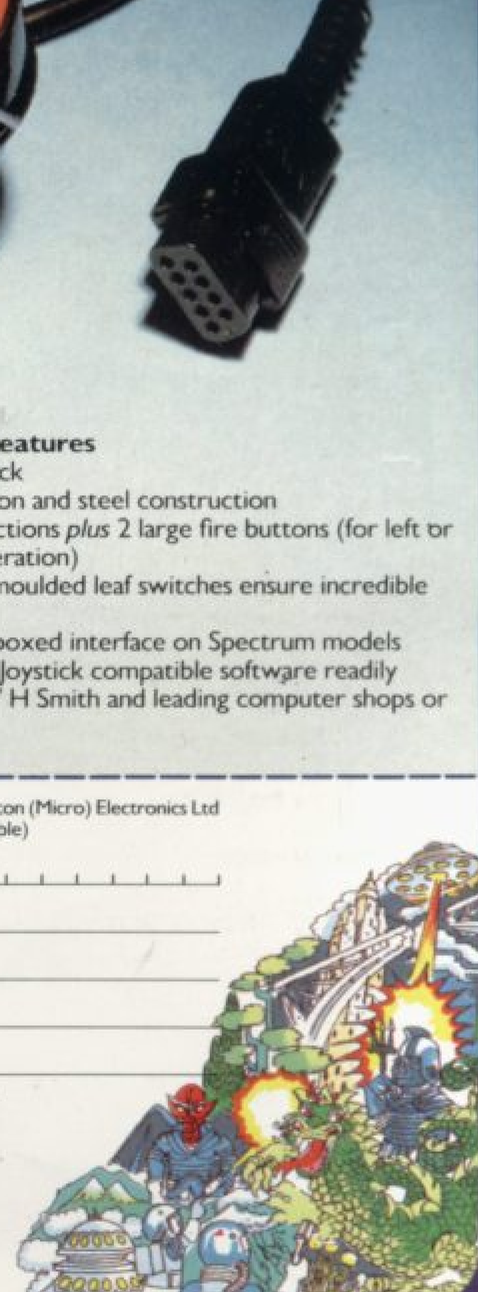
Spectrum gets a supporting role of architects

We hear the roar of the mighty Dragon

Discover the best addresses for powerful programming

READ HELPLINE FOR THE BEST ADVICE


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JOYSTICK
PRECISION GAME CONTROL!
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JOYSTICK
Outstanding Features
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• Super strong nylon and steel construction
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• Arcade proven moulded leaf switches ensure incredible reliability
• Complete with boxed interface on Spectrum models
• A wide range of Joystick compatible software readily available from W H Smith and leading computer shops or direct from us
BARCLAYCARD
VISA



Contents

incorporating Spectrum User

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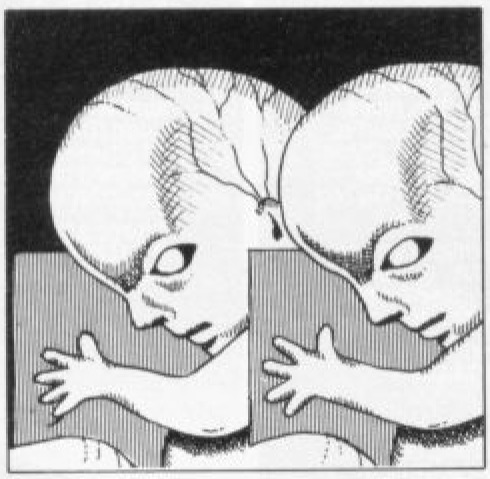
If you would like to contribute to any of the Sinclair User group of publications please send programs, articles or ideas for hardware projects to:
Sinclair User and Programs,
ECC Publications,
30-31 Islington Green,
London N1 8BJ

Programs should be on cassette and articles should be typed. We cannot undertake to return them unless a stamped-addressed envelope is included.
We pay £10 for the copyright of each program published and £50 per 1,000 words for each article used.

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Richard Dunn



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NEXT MONTH

We shall announce details of our new programming awards sponsored jointly with CCS. More than £2,000 in prizes is being offered in the search for the programmers of the future. Do not miss your copy.

"IT LOOKS NICE BUT WHAT THE HELL CAN I DO WITH IT?"

Every ZX SPECTRUM Print'n'Plotter Jotter has 100 pages of finely printed screen grids.

50 for the high resolution screen. 50 for the normal character screen.

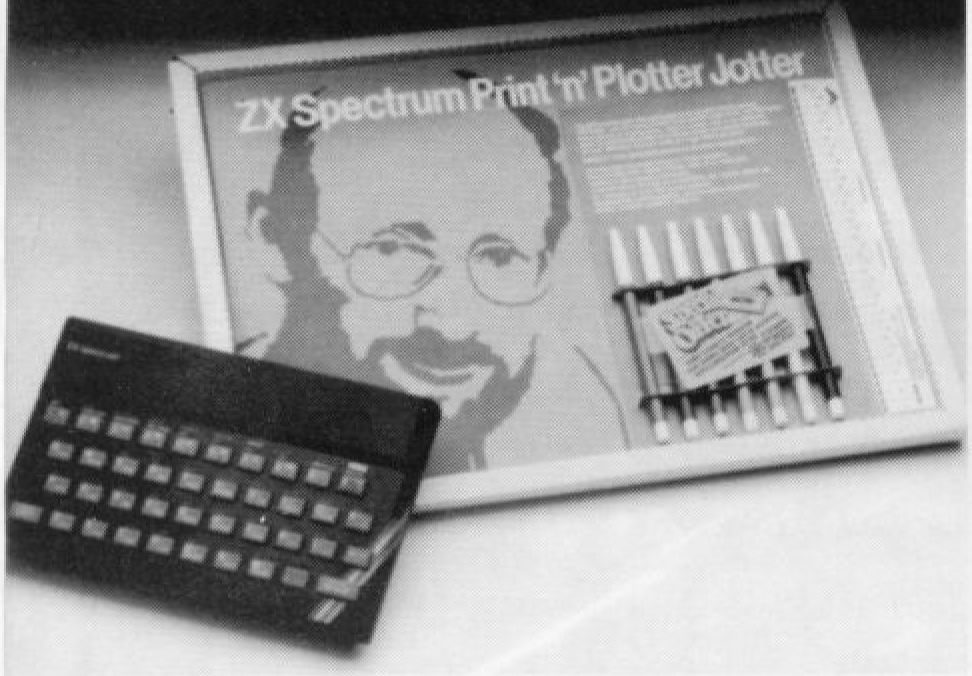
With these at your disposal you can plan practically any graphics print-out to program into your computer.

The high-resolution PLOT grid shows every one of the 45,060 pixels! Every one printed. Every one with its co-ordinate numbers. This gives you enormous graphics power to DRAW, PLOT, CIRCLE, PLOT OVER and so on in any position or screen building up graphic drawings, charts, maps ... in fact anything without the complications of guesswork, integer out of range, or wrongly positioned pixel colours which change PRINTed INK characters!

The normal character PRINT grids on the other hand will allow you to be specific about PRINT AT, TAB, PRINT OVER, SCREEN$ and INK/PAPER in direct co-ordination with PLOT ... you see every page is printed on **high quality tracing paper** ... ideal to overlay on to illustrations and 'copy' or co-ordinate.

And there's another bonus, because each page contains 24 User-definable grids — **2400 per pad!**

With 50 pages of PLOT grids, 50 pages of PRINT grids 2400 user-definable grids, a set of colour pens, a printed PIXEL RULER and our Special Offer of demo programs, IT'S THE BEST VALUE IN ZX GRAPHICS PROGRAMMING.



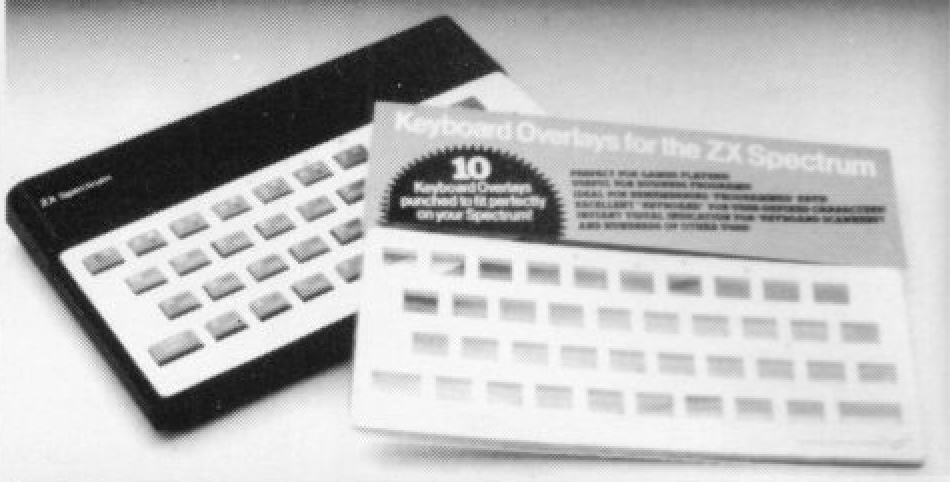
"NOW WHICH KEY DO I PRESS TO SHOOT DOWN THE THING FROM MARS?"

Ever forgotten which key to press when playing a game?
Do you suffer from a mind-boggling mass of programmed keys?
Do you write programs that use different keys to perform various functions? If so, we have just the thing for your ZX SPECTRUM.

A pack of Print'n'Plotter Keyboard Overlays.

Just write the function or functions under each key you program and keep the overlay for the next time you play the game.
Of course there's lots of more uses you will find for our OVERLAYS, user defined characters, keyboard scanners, mathematical programs, business uses — to name just a few.

There's TEN OVERLAYS to a pack — so you can program with impunity! And they fit perfectly onto your standard ZX SPECTRUM KEYBOARD. Each OVERLAY is printed with the cursor movement key directions and there's room for program name etc.



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For the cost of a 'games' cassette you can have a truly professional console for your SPECTRUM!

We've cut costs (not cut quality) by designing a self-assembly method using relatively inexpensive materials like strong corrugated board.

The result is a console that's tough, light, highly finished and capable of giving years of useful service.

Facilities include ergonomic keyboard angle, access to rear of machine, choice of P.S.U. internal or external, and alternative of Printer on-board or cassette storage area. Fully illustrated instructions are included.



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Five rolls of our PRINTER PAPER will only cost you £12.50 including postage, packing and VAT! And you'll gain a great deal more!
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.... ZX81 GRAPHICS PROGRAMMING GUIDE @ £1.50 each

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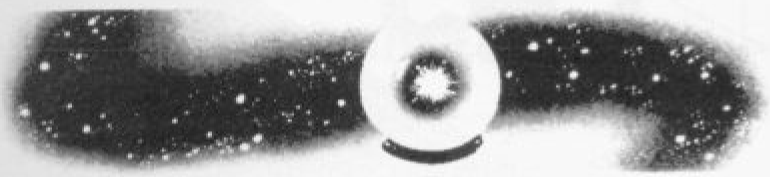
Early end for the ZX-81?

IN 1980, Clive Sinclair surprised the world and set himself back on the road to fame and fortune by introducing the first computer for less than £100. There had been programmable calculators costing less which had been on sale for some time but that was the first time a machine which could properly be called a computer had been put on the market.

It had only 1K and its black and white graphics were limited, but it was a computer. If Clive had done nothing after that he would have been assured of a prominent place in the development and spread of the use of computers.

Three years later, however, we have the 16K Spectrum for the same price of £99.95. Sixteen times the RAM, far better graphics and colour, are all now available. At that rate of progress it is amazing to think what might be possible in the next three years.

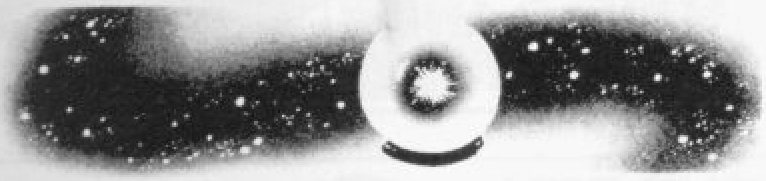
The next stage is probably fairly easy to predict. It is widely



expected that the new machine planned by Sinclair Research will be a portable computer intended for the business market. In the home market, however, the next steps are likely to be an improvement on the Spectrum. All Sinclair users know that there are plenty of areas in which the Spectrum can be improved. Better sound, the ability to obtain more complex graphics, and a standard keyboard would be likely to feature on everyone's list, along with a debugged ROM.

It is unlikely, though, that Sinclair would be willing to make small-scale improvements to a successful machine. Any new computer would thus be different in many ways from the Spectrum, while still being based on the technology which has already been developed.

For an idea of what the addition to the Sinclair range might



be like it is good idea to look across the Atlantic at what Timex is planning to do. The major changes which are expected in producing the TS2000 are the removal of the ROM bugs and the addition of a ROM cartridge port to ease the problems of loading pre-recorded programs.

If in Britain better sound and graphics and an improved keyboard are included, there is the basis of a new computer to compete in the home market.

From there we must move into the realm of even greater speculation based on the experience of previous developments in electronic products and the innovation of Sinclair Research. For a start we have the other developments in the company, particularly the flat-screen television and the Microdrive.

It has already been announced that both would be part of the portable business machine, so there is no reason to suppose that they could not also be part of a home computer. By increasing the size of the screen to that of a portable television, it would probably be possible to have a computer which looked just the same as a small set with a keyboard.

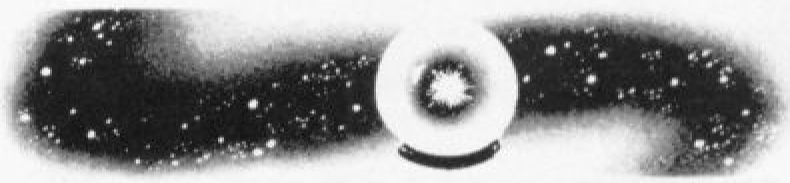
It should not be too difficult to take the Microdrive interface on board which, as it includes a RS232 interface, would allow a normal printer to be used with it.

Put all that together and you have a machine looking similar to what everyone assumes a computer should look like but with vastly increased power and at a fraction of the cost.

There is only one consideration which could stop that picture developing. While many people have criticised Sinclair machines for not looking like proper computers, it has certainly been one of their advantages that they have been easily recognisable. The closer the company moves to the expected formula of a computer, albeit with more power and at less cost, it loses some of its character. It is just another machine in a very crowded market.

Sinclair is no doubt aware of that and with its award-winning designer, Rick Dickinson, is probably working on ways of avoiding that situation. One idea from the *Sinclair User* think tank is to have a cased keyboard containing the computer with a hinged lid containing the screen but we are sure that the Sinclair research department has plenty of ideas of its own.

With improved chip development, it is also likely that



memory will become cheaper in much the same way that prices of calculators fell dramatically in a very short time. The first result of that will be a steady fall in prices, as is beginning with the Spectrum.

That will probably mean the early end to sales of the ZX-81. Few people will be willing to buy a basic machine of that kind, no matter how small the price, when a machine with the capabilities of the Spectrum might cost very little more.

There is probably a base price for computers of about £30. When a machine reaches that price it would be better to increase the facilities rather than to reduce the price any further.

Another outcome of those developments would be the end to the split between the business and home markets. With more power for less money it is inevitable that a manufacturer will make a product which can handle the needs of a small business, yet cheap and compact enough to be within reach of the home user. Sinclair Research could be the company to offer such a machine.

One thing is certain. In another three years the home computer market will be vastly different from what we know today. Computers in the home will be more accepted and those who bought the ZX-80, ZX-81 and the Spectrum will be seen as pioneers of a new leisure industry. There will be vintage computer clubs for the nostalgia market — and the acceptance of powerful machines as part of the furniture.

dk'tronics

ZX KEYBOARD FOR USE WITH/81 SPECTRUM

Our new cased keyboard has 52 keys, 12 of these are used for the numeric pad. The numeric pad offers some useful features, you can cursor with one hand and it will be a boon for anyone who enters a lot of numeric data. The pad is a repeat of the 1-9 keys plus it has a full stop and a shift key. The numeric pad keys are coloured in red, the normal keyboard keys are grey, with the case being black which makes the whole thing very attractive. The case measures 15 × 9 × 2½. The computer (either 80/81 or spectrum) fits neatly inside. You will have to remove the computer from its original case, it is then screwed to the base of the case. The case had all the bosses already fitted and the screw holes are marked. Also fitted inside the case is a mother board (81 model only) which allows 16K, 32K and 64K to be fitted in the case. All the connections are at the rear of the case i.e. Power, Mic, Ear, T.V. and the expansion port. The case is large enough for other add ons also to be fitted inside. One of these could be the power supply, then you could very quickly fit a mains switch, or a switch on the 9V line. This means you have a very smart self-contained unit. This case does not stop you from using any other add-ons that you may have e.g. Printer etc. We are convinced that this is the best keyboard available at present. It offers more keys and features than any other keyboard in its price range.

£45



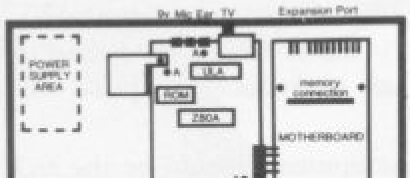
NOTE

The case can be purchased separately with the keyboard aperture uncut, so if you have one of our early uncased keyboards, or in fact any other suppliers' keyboards, these could be fitted. The keyboard is connected to your computer by a ribbon cable and this has connectors fitted which simply push into the Sinclair connectors. It is a simple two minute job and requires no electronic skills. This keyboard does not need any soldering. Please specify on order whether you require the ZX 81 or Spectrum case.

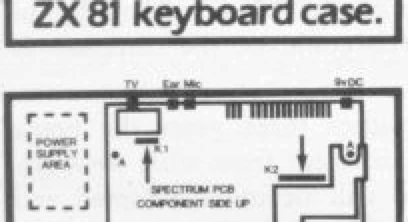
SPECTRUM MODEL

This is supplied with spectrum legends, and a slightly different base for fitting the spectrum inside, again all the connectors are at the rear of the case and there is plenty of room for the power supply (and other add-ons). Should you want to change, we can supply both the Spectrum legends and details of updating your case which will enable modification from the ZX 81 to spectrum. PLEASE specify on your order whether you require the ZX 81 or spectrum case.

KEYBOARD (SPECTRUM/81)



Internal fixing for ZX 81 keyboard case.



Internal fixing for spectrum keyboard case.

SPECTRUM LIGHT PEN

The pen enables you to produce high resolution drawings on your own television set, saving a vast amount of time over using basic programming statements, such as Plot, Draw etc. You can erase, modify and save drawings and it comes complete with software program. The superb light pen is available from D.K. tronics.



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16K Memory Ex
The 16K uses 4116
Static Ram and oc
using the Static Ra
speed low power
the computer. Al
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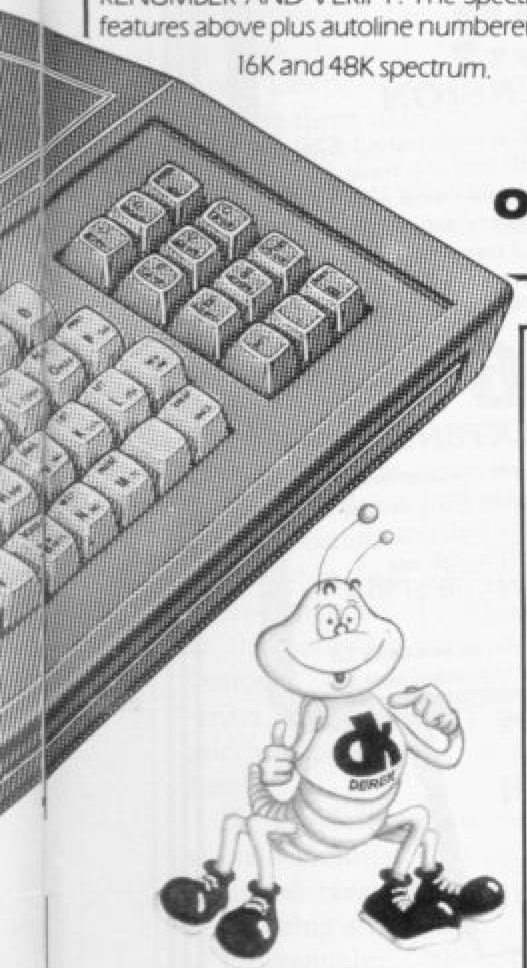
64K Memory Ex
All the above info
advantage lies in t
56K of usable mem
the use of other a
8192-65536. The
Spectrum Memo
Upgrade your Spe
it is simply slipped
are supplied, and
time. The fitting r
same as Sinclair's

ZX 80~81 Spectrum HARDWARE

SPECTRUM/81 TOOLKIT

This is the toolkit which won acclaim in the feature in the August 1982 issue (pages 29 and 30) of Sinclair User, "It is the most impressive program, fast in execution with clear and full instructions...it stands out from the rest of the field." The ZXED is a powerful editor for use on the expanded ZX81. It is intended for use by the serious BASIC programmer and offers several useful and time saving features most helpful during all stages of program development. The facilities provided are as follows: ALTER, BYTES, COPY, DELETE, FIND, HELP, INSERT, KEEP, MOVE, RENUMBER AND VERIFY. The Spectrum Toolkit contains most of the features above plus autoline numberer and append, and will run in the 16K and 48K spectrum.

Both at only £6.95



4K GRAPHICS ROM £24.95

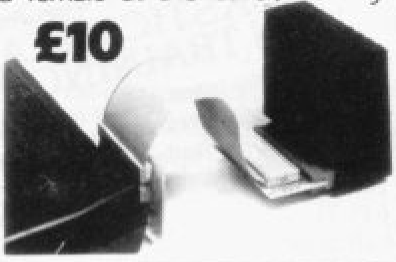
The DK Graphic module is our latest ZX 81 accessory. This module unlike most other accessories fits neatly inside your computer under the keyboard. The module comes ready built, fully tested and complete with a 4K graphic ROM. This will give you an unbelievable 448 extra pre-programmed graphics, your normal graphic set contains only 64. This means that you now have 512 graphics and with their inverse 1024. This now turns the 81 into a very powerful computer with a graphic set rarely found on larger more expensive machines. In the ROM are lower case letters, bombs, bullets, rockets, tanks, a complete set of invaders graphics and that only accounts for about 50 of them, there are still about 400 left (that may give you an idea as to the scope of the new ROM). However, the module does not finish there, it also has a spare holder on the board which will accept a further 4K of ROM/RAM. This holder can be fitted with a 1K/2K/RAM and can be used for user definable graphics so you can create your own custom character sets.

WHY WAIT?
ORDER TODAY FOR FAST DELIVERY

FLEXIBLE RIBBON CONNECTOR

If you have ever had whiteouts or system crashes this could be the answer. It stops the movement between the computer and the RAM expansion, it is supplied with a ribbon, 6 inches long, with a male connector at one end and a female at the other, at only

£10



16/64 MEMORY FOR ZX 81



The above illustration shows the casing for the 16K or massive 64K.

Expansion £22.95
16 Dynamic Ram Chips. We use the dynamic as they are much denser than occupy less space. They are also much cheaper than the equivalent product Ram. The Ram is manufactured with high quality materials, and uses high Rams. It is supplied ready-built and only needs to be plugged into the rear of All the components are fitted into holders. This massive add-on memory you fully assembled and tested is the cheapest 16K memory available any- in memory from 16384 to 32768. (Same as the Sinclair memory.)
16K (UNCASED) £19.95

Expansion £52.95
formation on the 16K also applies to the 64K Memory Expansion, but the the 64K giving nearly FOUR times the memory. This advanced model has memory. In addition, the block from 8K to 16K can be switched out to enable add-ons. The graphics ROM is to be used in this area. Position in Memory: Block From 8192-16384 is switchable. **64K (UNCASED) £49.95**

mory Expansion MK1 £35.00, MKII £30.00.
ectrum to 48K of user Ram. The Spectrum memory expansion is simple to fit, d inside the case, and then only requires plugging in. Full fitting instructions d the only tool you will need is a screwdriver and just two minutes of your requires no electronic skills. Position in memory from 32768 to 65536. (The s upgrade to 48K).

Please state type of machine, which Rom memory size, quantity and place when ordering.

Please send me . . . . @ £ . . . .

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Please add on £1.25 for P/P
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New colour brochure now available, send SAE for quick return

Meet the voice at the end of the telephone query service

Help-line man is revealed

WE THOUGHT it was time we introduced the man who operates the club Help-line. Andy Lawrie is 35, married, and has three daughters aged between 10 and six. He is employed as a computer engineer with a third-party mainframe computer maintenance company, where he is shift leader at a large site in London.

He maintains two Amdahl 460 and two NAS 9060 processors, plus hundreds of disc and tape drives, printers, communications processors, and even a few SuperBrain microcomputers. In addition to the hardware side of the business, he manages and writes programs for a major microcomputer software house.

He was fortunate to be in at the beginning of the microcomputer boom, his first machine being a Scrumpi.

Programming the little beast was really hard work but it provided a thorough grounding in how a microprocessor chip operates.

The next stage was to build a Triton computer, as published in an electronics magazine. It had a 2K Tiny Basic; a rather limited monochrome display; a slow, unreliable cassette interface; and could be expanded from 1K to 3K RAM. It cost about £350 — probably the equivalent of £550 at today's prices — and was the best you could obtain at anything like the price.

The Triton was extended gradually, mostly to Lawrie's design, during a period of three years, to the stage where it was running CP/M on disc, although by then it had virtually none of the original circuitry left.

On a bench next to the Triton there resides a S-100 bus computer with a 15MB Winchester disc, which is used as a word processor when replying to your queries. The big disc also holds a database of members' names and addresses, which is helpful when members want to contact other local members.

The database is updated regularly by the Club offices and sent to Lawrie on floppy disc. There is an Epson printer and a range of modern micros — a ZX-81, Spectrum, Oric, Lynx; Lawrie's favourite is the Spectrum.

You will be able to see that he is well-qualified to answer most of your questions but you can be sure of one thing — if he does not know, he will not 'flannel'. Some of the subjects about which he is asked are very wide-ranging; recently he was asked questions about copyright law.

At this point, he has asked us to make a request. The most difficult questions are often those about specific programs or hardware add-ons. They can be very difficult as it would be impossible to be familiar with them all. His advice, in those instances, is usually first to consult the manufacturer or suppliers, as they should know most about their products.

Large discounts given by Abbex and DJL on arcade-quality games

BIG DISCOUNTS on a number of software items are available in this month's special offer. They include a wide range of cassettes for the Spectrum and some of the best games on the market for the ZX-81.

We have been able to secure from Abbex a 20 percent reduction in the price of all its cassettes, which include **Spookyman** and **Android's Run.** Owners of the ZX-81 will be able to save 25 percent on **Zuckman** and **Froggy** from DJL Software. Froggy is also available for the Spectrum. The full range of games included in the offer is shown below with the normal and offer prices.

As usual, the offer is open only to members but so that new members can take advantage of the discounts, orders can be included with the application.

Existing members should send orders to Abbex Electronics, 20 Ashley Court, Great North Way, London or DJL Software, 9 Tweed Close, Swindon, Wiltshire.

	List price	Offer price
Abbex		
Spookyman	£4.95	£3.95
Cosmos	£4.95	£3.95
Androids Run	£5.95	£4.75
High Noon	£5.95	£4.75
ETX	£5.95	£4.75
Invasion	£5.95	£4.75
Faust's Folly	£5.95	£4.75
DJL		
ZX-81		
Zuckman	£5.95	£4.45
Froggy	£5.95	£4.45
Spectrum Froggy	£5.95	£4.45

MEMBERSHIP FORM

I wish to join the Sinclair User Club and enclose my subscription of £12

Name . . . .

Address . . . .

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Which computer do you own?

ZX-81 ☐ Spectrum ☐

Send your coupons to Sinclair User Club, ECC Publications, 30-31 Islington Green, London N1 8BJ. Cheques should be made payable to Sinclair User Club.

Sinclair User Club

Britain

Aylesbury ZX Computer Club: Ken Knight, 22 Mount Street, Aylesbury (5181 or 630867). Meetings: first Wednesday and third Thursday of the month.

Basildon Microcomputer Club: Roger Sims, Wickford 63032, after 6.30pm. Meetings every other week on Tuesdays from 7.30 to 10pm at Healey Management Services, The Hemmels, Laindon, Essex.

Bristol Yate and Sodbury Computer Club: 99 Woodchester Yate, Bristol, BS17 4TX.

Colchester Sinclair User Group: Richard Lown, 102 Prettygate Road, Colchester CO3 4EE.

Doncaster and District Micro Club: John Woods, 60 Dundas Road, Wheatley, Doncaster DN2 4DR; (0302) 29357. Meetings held on second and fourth Wednesday of each month.

Eastwood Town Microcomputer Club: E N Ryan, 15 Queens Square, Eastwood, Nottingham NG16 3BJ.

Edinburgh ZX Users' Club: J Palmer (031 661 3183) or Ken Mitchell (031 334 8483). Meetings: second Wednesday of the month at Claremont Hotel.

EZUG-Educational ZX-80-81 Users' Group: Eric Deeson, Highgate School, Birmingham B12 9DS.

Furness Computer Club: R J C Wade, 67 Sands Road, Ulverston, Cumbria (Ulverton 55068). Meets every other week on Wednesday evenings.

Glasgow ZX-80-81 Users' Club: Ian Watt, 107 Greenwood Road, Clarkston, Glasgow G76 7LW (041 638 1241). Meetings: second and fourth Monday of each month.

Gravesend Computer Club: c/o The Extra Tuition Centre, 39 The Terrace, Gravesend, Kent DA12 2BA. Bi-monthly magazine and membership card.

Hassocks ZX Micro User Club, Sussex: Paul King (Hassocks 4530).

Inverclyde ZX-81 Users' Club: Robert Watt, 9 St. John's Road, Gourock, Renfrewshire PA19 1PL (Gourock 39967). Meetings: Every other week on Monday at Greenock Society of the Deaf, Kelly Street, Greenock.

Keighley Computer Club: Colin Price, Redholt, Ingrow, Keighley (603133).

Lambeth Computer Club: Robert Barker, 54 Brixton Road, London SW9 6BS.

Liverpool ZX-Computer Centre: Keith Archer, 17 Sweeting Street, Liverpool 2.

Merseyside Co-op ZX Users' Group: Keith Driscoll, 53 Melville Road, Bootle, Merseyside L20 6NE; 051-922 3163.

Micro Users' Group: 316 Kingston Road, Ewell, Epsom, Surrey KT19 0SY.

National ZX-80 and ZX-81 Users' Club: 44-46 Earls Court Road, London W8 6EJ.

Newcastle (Staffs) Computer Club: Meetings at Newcastle Youth and Adult Centre, Thursday, 7.30 to 10 pm. Further information from R G Martin (0782 62065).

North Hertfordshire Home Computer Club: R Crutchfield, 2 Durham Road, Stevenage; Meetings: first Friday of the month at the Settlement, Nevells Road, Letchworth.

Northern Ireland Sinclair Users' Club: P Gibson, 11 Fitzjames Park, Newtownards, Co Down BT23 4BU.

North London Hobby Computer Club: ZX users' group meets at North London Polytechnic, Holloway Road, London N7 each Monday, 6pm.

Nottingham Microcomputer Club: ZX-80-81 users' group, G E Basford, 9 Holme Close, The Pastures, Woodborough, Nottingham.

Orpington Computer Club: Roger Pyatt, 23 Arundel Drive, Orpington, Kent (Orpington 20281).

Perth and District Amateur Computer Society: Alastair MacPherson, 154 Oakbank Road, Perth PH1 1HA (29633). Meetings: third Tuesday of each month at Hunters Lodge Motel, Bankfoot.

Regis Amateur Microcomputer Society: R H Wallis, 22 Mallard Crescent, Pagham, Bognor Regis, West Sussex PO21 4UU.

Scunthorpe ZX Club: C P Hazleton, 26 Rilestone Place, Bottesford, Scunthorpe; (0724 63466).

Sheffield ZX Users' Club: A W Moore, 1 Ketton Avenue, Sheffield S8 8PA, Yorkshire. Annual subscription 10, monthly newsletter and cassette.

Sittingbourne: Anurag Vidyarth (0795 73149). Would be interested to hear from anyone who wants to start a club near the Medway towns.

Stratford-on-Avon ZX Users' Group: Chris Parry, 16 Sackville Close, Stratford-on-Avon, Warwickshire.

Swansea Computer Club: B J Candy, Jr Gorlau, Killay, Swansea (203811).

Swindon ZX Computer Club: Andrew Bartlett, 47 Grosvenor Road, Swindon, Wilts SN1 4LT; (0793) 3077. Monthly meetings and library.

Sutton: Sutton Library Computer Club, D Wilkins, 22 Chestnut Court, Mulgrave Road, Sutton, Surrey SM2 6LR.

Worle Computer Club: S W Rabone, 18 Castle Road, Worle, Weston-super-Mare BS22 9JW (Weston-super-Mare 513068). Meetings: Woodsprings Inn, Worle, on alternate Mondays.

ZX-Aid: Conrad Roe, 25 Cherry Tree Avenue, Walsall WS5 4LH. Please include sae. Meetings twice monthly.

ZX Guaranteed: G A Bobker, 29 Chadderton Drive, Unsworthy, Bury, Lancashire. Exchanges information and programs throughout the country.

ZX-80/ZX-81 Users' Club: PO Box 159, Kingston-on-Thames. A postal club.

Overseas

Belgium: ASBL BDMA Belgium National Sinclair Club; P Glenisson, Rue De l'Epeestraat, 14, 1200 Bruxelles.

Belgium, France and Luxembourg: Club Sinclair, Raymong Betz, 38 Chemin du Moulin 38, B-1328 Ohain, Belgium (322 6537468).
Belgian User Group for Sinclair owners (BUGS); Op de Beeck, Patrick, Drabstraat 144, 2510 Mortsel.
Micro-Europe Club; R Betz, Chemin du Moulin, B1328, Ohain, Belgium. Telephone: CCP 000 0846556-37.

Denmark: Danmarks National ZX-8081 Klub (DNZK), Jens Larson, Skovmosevej 6.4200 Slagelese, post giro 1 46 24 66.
ZZ-Brugergruppen i Danmark, Boks 44, 2650 Hvidovre, Gratis medlemskab og gratis blad til enhver interesseret.
J Niels-Erik Hartmann, OZ-ZX-Radioamator, Bruger Gruppe, Bredgade 25 DK-4900, Nakskov.

East Netherlands: Jonathon Meyer, Van Spaen Straat 22,6524 H.N. Nijmegen; (080 223411).

Germany: ZX-80 Club, a postal club; contact Thomas Jencyzyk. Hameln, Postfach 65 D-3250 Hameln, Germany.

Indonesia: Jakarta ZX-80/81 Users' Club, J S Wijaya, PO Box 20, Jkukg, Jakarta, Utara, Indonesia.

Irish Amateur Computer Club: Martin Stapleton, 48 Seacourt, Clontarf, Dublin 3. (331304).

Italy: Sinclair Club, Vie Molimo Veccho so/F, 40026 Imola, Italy.
Genova Sinclair Club; Vittorio Gioia, Via F Corridoni, 2-1, telephone 010 3125 51.

Micro-Europe: Belgium or Club Paris-Micro, 19 Rue de Tilly, 92700, Colombes, France; associated with Club Micro-Europe.

Republic of Ireland: Irish ZX-8081 Users' Club, 73 Cnoc Crionain, Baile Atha, Cliath 1.

Singapore: Sinclair Users' Group: Eric Mortimer, 1D Wilmer Court, Leonie Hill Road, Singapore.

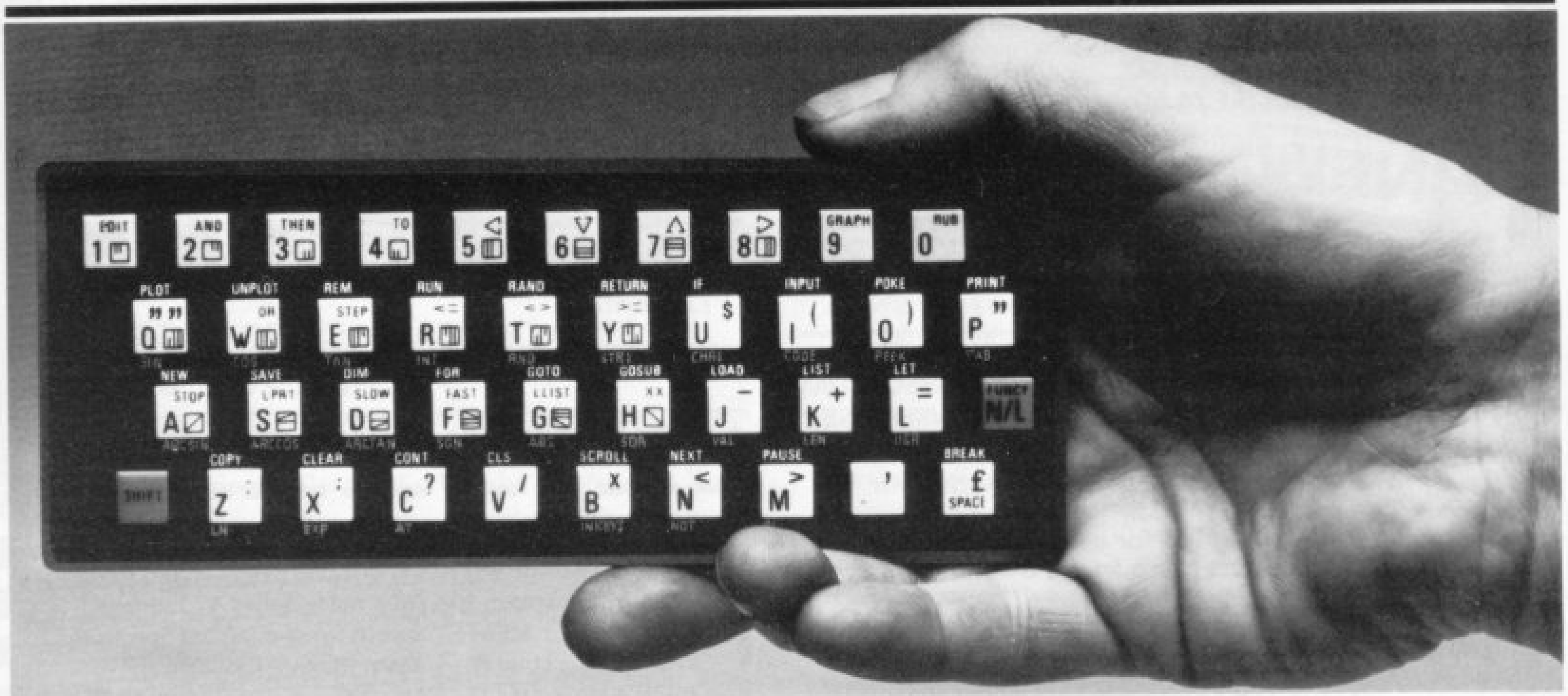
South Africa: Johannesburg ZX-80-81 Computer Users' Club: S Lucas, c/o Hoechst SA (Pty) Ltd, PO Box 8692, Johannesburg.
Johannesburg ZX Users' Club: Lennert E R Fisher, PO Box 61446, Marshallstown, Johannesburg.

Spain: Club Nacional de Usuarios del ZX-81, Joseph-Oriol Tomas, Avda. de Madrid, No 203 207, 10, 3a esc. A Barcelona-14 Espana. International ZX Spectrum Club: Gabriel Indalecio Cano, Sardana, 4 atrico 2a, San Andres de la Barca, Barcelona. Send international reply coupon. Produces a bi-monthly magazine. Spanish ZX Micro Club: Apartado 181, Alicante (Costa Blanca), Spain.
ZX Club Spain; C Benito PO Box 3253, Madrid, Spain.

Swedish ZX-club: Sinclair Datorklubben, Box 1007, S-122, 22 Enskede, Sweden.

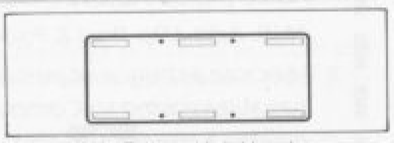
United States: Bay Area ZX-80 User Group, 2660 Las Aromas, Oakland CA94611.—Harvard Group, Bolton Road, Harvard MA 01451: (617 456 3967).

NOW. A ZX81 PUSH-BUTTON KEYBOARD FOR UNDER £10.

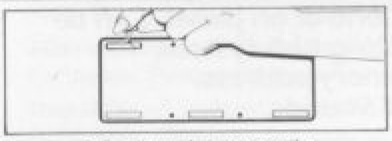




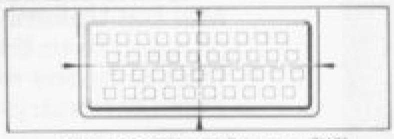
1. Make sure the original keyboard is clean and check that all the keys function.



2. The Buttonset is held in place by self-adhesive pads.



3. So all you do is remove the protective backing.



4. And place it centrally on your ZX81.

At last there's a really cheap but efficient way of ironing out the ZX81's only real bug: its keyboard. The Filesixty Buttonset offers:

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Tel: 01-289 3059. Telex: 268 048 EXTLDN G 4087.

Orders to Filesixty Ltd., FREEPOST, London W9 2BR.

Cheques/PO made payable to Filesixty Ltd.

Please send me ________ (qty) Buttonset(s) at £9.95 each (including VAT and P&P).

Total £ ________ BLOCK CAPITALS

Name ________

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SU9

FILESIXTY

Microdrive promised 'in a month or so'

SINCLAIR RESEARCH now has an official target date for release of the Microdrive. The company is keeping the precise date secret but a spokesman said:

"The release will be within the next month or so. We are at such an advanced stage that we have our target date."

The Microdrive will be offered to the first 1,000 people who ordered a Spectrum last year. The reason is that Sinclair wants to compensate for the long periods of waiting experienced by many customers last year.

The device was announced last year when the Spectrum was launched. Since then customers have been promised several launch dates but the Microdrive never appeared.

The delays have been caused because Sinclair has had difficulty with the prototypes of the device. The drive contains a floppy tape cartridge and the tape which was tried at first started to stretch in tests. Sinclair had to find a replacement, and metal tape, costing considerably more than ordinary tape, was discussed.

Sinclair met criticism from the Advertising Standards Authority about its advertisement for the device but the company now hopes its new target date will be met.

New award offers £2,000 in prizes

MORE THAN £2,000 is being offered in prizes in a new award for programming being sponsored by *Sinclair User* and CCS. The award will be launched in *Sinclair User* next month and it is intended it should be made annually. There will be a theme each year and this year the judges will be looking for the best strategy and adventure program.

The idea is to stimulate good programming skills and one of the considerations for finding the winner will be programming style. Other features such as originality and the ease of using the cassette will also be taken into account.

The winner will be awarded £1,000 and have the opportunity to have the program published. The winner can be a program for either the Spectrum or the ZX-81 but the second, third and other prizes will be split between the two machines.

The judges will be well-known figures in the Sinclair market. The award will be made at the ZX Microfair before Christmas. *Sinclair User* is also looking to expand the interests it covers each month. We are looking for short stories of about 2,000 words with a computer theme. Any budding authors should send typed manuscripts for consideration.

Spectrum Top Ten

Program	Last month	Company	Memory
1 Flight Simulation	12	Psion	48K
2 The Hobbit	1	Melbourne Hse.	48K
3 Penetrator	5	Melbourne Hse.	48K
4 Vu-3D	6	Psion	48K
5 Horace Goes Skiing	14	Psi/Ml. Hse.	16K
6 Vu-File	17	Psion	16K
7 Hungry Horace	10	Psi/Ml. Hse.	16K
8 Planet of Death	16	Artic Computing	48K
9 Transylvanian Twr.	3	Shepard	48K
10 Chess	—	Psion	48K

Compiled by W H Smith.

ZX-81 Top Ten

Program	Company	Memory
1 Flight Simulation	Psion	16K
2 Monster Maze	New Generation	16K
3 Galaxians	Artic Computing	16K
4 Chess	Psion	16K
5 Catacombs	J K Greye	16K
6 QS Scramble	Quicksilva	16K
7 Space Raiders	Psion	16K
8 Gulp	Campbell	16K
9 Mazogs	Bug-Byte	16K
10 Avenger	Abacus	16K

Compiled by W H Smith.

Retail fears for ZX-81

THE FALL in the price of the ZX-81 has given rise to fears that W H Smith, the biggest retailer of Sinclair products, is reducing its stocks of hardware and software to withdraw from the ZX-81 market.

It has been said Smiths reduced the price £10 lower than other dealers because it had 20,000 ZX-81s in stock and wanted to sell them faster. A spokeswoman for the company denied the fears. She said:

"The ZX-81 is still a very popular machine and we will continue to stock it. We have no plans to drop either the ZX-81 or its software."

The company says that the only reason for falling stock levels of ZX-81 software is that few companies are still producing tapes for the machine.



BOB DENTON

Bob Denton, managing director of Prism Microproducts, which is the wholesale distributor for Sinclair Research, is worried by the moves in the market.

He regards the new price ridiculously low.

Market unites

A COMPUTER trade association has been formed by some of the biggest companies in the computer market. The association has been formed by Virgin Games Ltd, a division of Virgin Records, which specialises in computer games.

Representatives of retailers, distributors, software houses, manufacturers and consultants have been asked in a mass mail-out campaign to join the group, which is pledged to achieve a professional code of conduct to govern dealings in the trade and with the public.

Some of the smaller companies in the Sinclair market are beginning to worry about the Computer Trade Association and what it could mean to their businesses.

ROM cartridges are planned by Sinclair

SINCLAIR RESEARCH is to launch an adaptor for the Spectrum which will allow owners of the machine to use plug-in ROM cartridges. The launch date is set for late summer.

They will allow the user to have instant access to programs stored in the permanent Read Only Memory of the cartridges.

The adaptor will cost less than £20 and each cartridge will cost approximately £10.

One advantage of the system is that 16K machine owners will be able to run 48K programs, because the cartridges will not use the internal RAM of the Spectrum.

The range of software which is to be put on to ROM will include new languages, such as Forth, assemblers, disassemblers and arcade games.

Sinclair Research is already starting to approach software houses which it thinks can help with programs to go on to cartridge. The company hopes that its software will do well because cartridges sold by other computer manufacturers tend to be more expensive. It hopes to reduce the cost of cartridge software by almost half of current prices.

Breakdown risk cover

FOR THE first time Sinclair computer owners can insure their machines after the guarantee period has expired. The Personal Computer Insurance Scheme is run by Graham Brown and Co. It is the first specialist insurance scheme designed specifically for personal computers.

The scheme covers computers and peripherals in the home, in educational environments and in an office. The protection is against 'all risks', through both internal breakdown and accidental loss or damage during travel.

The cost of the insurance starts at £7.50 for a year on a system of a value up to £100. That increases depending on the value of the system involved.

Chris Bower, a director of Graham Brown, is confident that there is a need for the scheme. He says: "Many owners are now losing the benefit of their guarantees. Under most home contents policies, the only protection an owner can expect is against fire and theft."

To be eligible for insurance a computer must be no more than two years old at the time the policy is effected. The policy can then be continued until the owner sells the equipment.

More information can be obtained from Graham Brown and Co, Pannells Court, Guildford, Surrey, GU1 4EY.

Micronet adaptor launch soon

THE MICRONET adaptor for the Spectrum is due to be launched. The adaptor will allow users to connect machines to the Micronet system and to use the telesoftware facilities which are available. It will also provide the opportunity to use the thousands of pages on the British Telecom Prestel databases.

The adaptor was due to be launched in May but difficulties arose between Sinclair Research and Martochoice, which was to supply the device.

Prism Microproducts, a sister company of EEC Publications, took over development of the adaptor. Bob Denton, managing director of Prism, says: "The adaptor for the Spectrum is a Prism product entirely."

Martochoice was the joint winner of the Prestel ZX-81 Adaptor competition in 1981. Its adaptor was accepted as the official device for the ZX-81 and the company was to have helped with its manufacture.

The other joint winner was Lion Viewdata. Its device is still available and at £50 is £150 less expensive than that from Martochoice. The features of the Lion device include auto-dialing and automatic identity checking. It has also been modified for use on other computers, including the Spectrum.

It is possible to link the Spectrum to the Micronet system using several interfaces, including the Lion. All members of Micronet, however, have to buy an adaptor produced by the company before they can receive a password and are allowed to enter the system.

The software controlling the Prism adaptor has been designed specifically for use with Micronet and includes the routines to allow a user to enter the system.

Programs programme

BRISTOL-BASED independent radio station Radio West has been transmitting programs for popular microcomputers, such as the ZX-81 and Spectrum.

The transmissions have been made during the station's Datarama program on Monday evenings and after close-down each night.

The programs have been transmitted on VHF/FM and medium-wave frequencies. The VHF transmissions can be received over fairly long distances on a domestic radio receiver with a telescopic whip antenna. Medium-wave transmissions have been used because of problems caused by ground-wave and co-channel interference. The signal has to be strong and clear if it is to be recorded for loading into a computer.

Martin Schimmer, a spokesman for the company, says the broadcasts of computer programs will continue. He says:

"We have so much material that we can go on for a long time. We will continue with the programs until we run out of them."

Datarama covers many areas in computing, as well as broadcasting programs. The programme is broadcast each Monday between 7.30pm and 8pm. Listeners can tune in on 96.3MHz, 230 metres medium wave.

Show date

THE MALVERN Microcomputer Fair will be held at the Winter Gardens, Malvern, Worcestershire on Saturday July 2, from 10am to 5.15pm.

As well as the usual software, hardware and information exchange, visitors will have the chance to sell unwanted programs, books and computers.

Adaptable RAM pack

IN MAY in the Hardware World article on our RAM-LOK kit the author claims: "The RAM pack can be the only item used on the back of the ZX-81" and later "does not allow for the printer or any other device".

Those two statements are untrue. The fitting of our kit does not prevent the use of any other peripheral. If a ZX printer is used we recommend the use of the optional mounting bracket.

P J Turnbull,
Adapt Electronics,
Buckhurst Hill,
Essex.

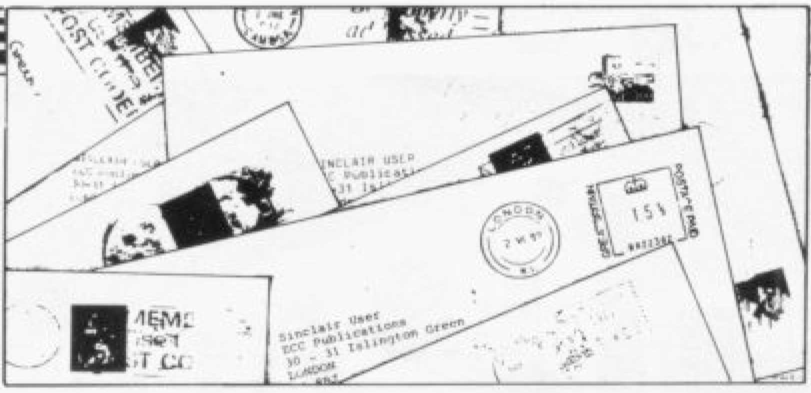
Resistance remedy

THERE HAVE been many complaints about the ZX-81 voltage regulator causing problems. Remedies have been tried, such as cutting extra slots or holes in the case; using thermpath between the regulator and heatsink; drilling the heatsink to increase the dissipation; or even making a larger heatsink.

Those are all remedies which are not totally effective as they aim at easing the symptom, not the cause. Having tried some of the remedies with only minor effect, I measured the voltage from the power unit; it was supplying 10.5V at 550mA, so the poor voltage regulator was having to eliminate 5.5V. I therefore obtained a resistance of 4-5ohms which I placed in the lead and that drops the supply to about 8.5V; the rating of the resistor should be an absolute minimum of 2W, preferably 5W.

The ZX now runs very happily for very long periods and the keyboard is scarcely warm, whereas previously it was hot.

W D Langton,
Midhurst, W Sussex.



Standards begin to fall

AS A REGULAR reader of *Sinclair User* with 11 editions under my belt, you may like to know some of my musings.

The standard of entries is, I am sure, beginning to fall, especially since the still birth of *Spectrum User*. I have owned a Spectrum since October, sweated blood with it in the early days and grown to love its basically good-natured, easy-going ways. It can, however, still be a bit of a pig — and that is where you come in.

You have to provide articles for those still finding their way round the keyboard and they should be of a high order but Sinclair users are growing up and your articles are not.

Now that *Sinclair Programs* is rising to dizzier heights, the listing of programs in *Sinclair User* have become more dross with gloss — no content at all worth incorporating in our programs.

It seems to me that only Hewson's column deserves a gold star, for your reviewers continue *ad nauseum* their soft-in-word-and-head approach to manufacturers' software. Let us see some bloody-mindedness for a change; other magazines do not seem so afraid to bite the benefactor's hand and, let us be honest, some expensive software is dreadful.

Your approach, however, seems to me to be the one Uncle Clive himself employs — shows promise, but exaggerates; misuses people's good nature.

You are spreading the jam too thickly with three magazines — *Sinclair User, Sinclair Programs* and *Sinclair Projects*. You antagonise ZX-81 users with Spectrum articles and vice versa. How about just two magazines — a ZX-81/Timex 1000 magazine with programs, projects, news, views, and a ZX-83/Spectrum/Timex 2000 magazine? No separate programs. Your magazines will be more dedicated, more caring, more user-friendly, more profitable and, as computer succeeds computer, more easy to drop. I am sure Sinclair and his users would approve.

As an educational postscript, how about a listing from another computer — do not say BBC or Atari or Apple or Vic — fully-analysed and translated into a Sinclair Basic listing.

How about a full list of PEEKs and POKEs for ZX-81 and Spectrum on a plastic card and how about help in translating ZX-81 into Spectrumese?

May *Sinclair User* go on and on.

F Duckworth,
Orrell, Wigan.

● *While not accepting the views, we understand that our readers have a variety of opinions which do not necessarily agree with our own. On the point about the numbers of magazines to serve the market, there are two ways it can be done. One is to have a magazine for each computer; the other is to have one for each type of use.*

We think it better to make the split by the type of user — Sinclair User *for the general Sinclair owner,* Sinclair Programs *for the software enthusiast, and* Sinclair Projects *for the person who enjoys building add-ons.*

In that way the magazines can adapt to change rather than launching a new magazine when a new machine reaches the market and disposing of an old one when the machines become less popular.

Figuring on 48K Spectrum

AN EDITORIAL published under the title of Figuring Things Out in the May issue of *Sinclair User* gives a brief account of University Software Library of Advanced Math/Stat/Econ. It is said that the "programs are available for the 16K ZX-81 and the 16K Spectrum. Tape one introduces matrix operations. The second explains polynomials."

From the enquiries concerning this editorial I understand that those three sentences leave the reader with the impression that our programs are not available for the 48K Spectrum and that tapes one and two "explain" only matrix operations and polynomials.

In fact, our range of software is available for 48K Spectrum as well as 16K ZX-81 and 16K Spectrum and tapes one and two are capable of carrying-out all five matrix operations and computing the real roots of polynomials as well as explaining them.

Please note our change of address, which is now 29 St Peters Street, London N1 8JP.

B S Borar,
Managing director,
University Software.

Spectrum versus Oric

REFERENCE John Gilbert's article on the Oric. I wish that people like him would write only informed articles and not the biased bunkum which seems to be the order of the day.

He has not understood how the Oric or the Spectrum works. His comment on saving variables — Spectrum uses LOAD DATA — the Spectrum has two facilities with variables; they can be saved with the program as per the Oric, or separately as a data file.

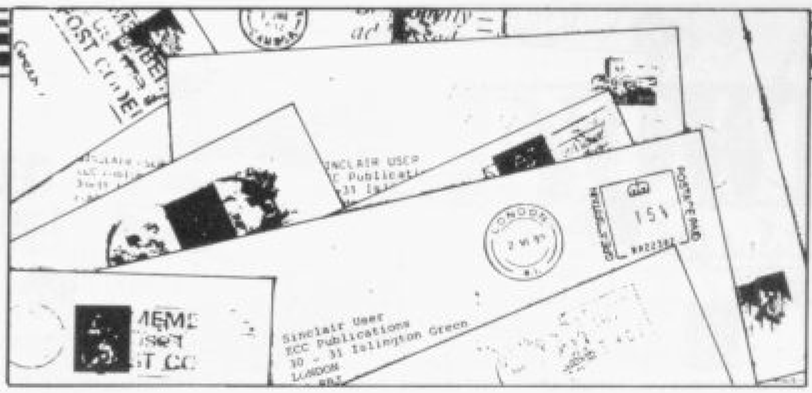
He says that the Oric has two modes of display, hi-res and normal. So has the Spectrum and it is easier to use — the Oric has a peculiar additional screen flash when cleared. He has also skipped over the main display problem with the Oric where the ATTRibutes file and screen file are mixed, making a very complex colour set up when printing moving CHRS on the screen. I could go on and make a large list of items where the Oric does not even begin to compare to the very friendly Spectrum.

B G Cornhill,
Aylesbury,
Bucks.

● *We agree that the Oric is not as user-friendly as the Spectrum but think that the reader has misunderstood the purpose of the article, which was to give an objective assessment of the Oric.*

The Oric, which is more memory-efficient than the Spectrum, has two types of main screen format. You can switch between text and high-resolution graphics to use memory either for program and data or display. On the Spectrum you cannot do so and 7K of memory is always used for the high-resolution display.

Letters should be kept as brief as possible and addressed to The Editor, Sinclair User, *30-31 Islington Green, London N1 8BJ.*



Testers for disabled aid

PLEASE ACCEPT my apologies. Some time ago I bought your magazine and felt that it left much to be desired. I was not impressed by the standard of materials or articles used. A short time ago I purchased the April edition and now believe I was over-critical and allowed my judgment to be clouded by snobbishness. I found the issue an excellent read and it contained some very good information.

One article in particular caught my imagination — Disabled Aid brought to my attention the need for modern technology to be adapted for people with serious disability of the body but very intelligent and active minds. I was so motivated that I immediately set about writing a program to achieve a similar end to that of the Regis Amateur Micro Society.

The thought which occurred to me was that if a program could be written which required only one key to operate, then anyone with any movement in any part of the body could use the ZX-81 to communicate, write letters, or — in the case of a second mode in my program — to draw pictures.

I have since spent a number of hours writing a program which goes a long way to meeting those needs and includes some extra facilities. I require one or more such disabled people to test the program and the ease of adaptability.

My services to any of the people will be voluntary and my only aim is to give such disabled people a means of communicating easily with others at the price of the cost of a cheap micro — the program should be easily adapted to other micros — and such peripherals as may be necessary so that programs may be entered and saved, and that printouts may be made.

Peter Doherty,
15 Wilkinson Road,
Elsecar, Barnsley.

Scrolling for the Spectrum

I HAVE discovered a scroll trick for the Spectrum. While the computer is printing-out a line a certain number of times it rather spoils it if the question "scroll?" appears at the bottom of the screen. I have overcome this simply by inserting the line INPUT INKEY$="y" so the whole screen is scrolled up.

Also I have a small program which prints-out a name 100 times in a sloping line:

```
5 BORDER 2: INK 7:
PAPER J
10 INPUT "Your name?";a$
20 FOR n=1 to 100
30 PRINT TAB 17*n;a$
40 INPUT INKEY$="y"
50 NEXT n
```

Timothy Richardson,
Quarndon, Derbyshire.

Radio hams united

CONGRATULATIONS on a well-presented and informative magazine. One area which is neglected is the amateur radio operators of the world. Most amateur operators are moving into the world of computers and the ZX-81 and Spectrum have the potential to open a new and exciting area of computing.

At the moment I am building a Morse code reader to interface to my 64K ZX-81 using a tone decoder and A/D converter.

I would like to hear from other readers who have information on Morse code readers or RTTY decoders suited to the ZX-81.

Is it possible to include perhaps one project per issue into *Sinclair User* as you do with program printout?

Daryl Ravenscroft,
Bougainville Island
Sinclair Users' Group,
PO Box 647,
Arawa, North Solomons
Province,
Papua New Guinea.

Hooked on Sinclair

I BEGAN using my Spectrum and I discovered *Sinclair User* when a friend who also owned a Spectrum introduced it to me. Now when I read one month's issue I seem to enjoy it so much I cannot wait till the next month's is published. I would like to thank and congratulate the publishers of such an excellent magazine and it pleases me to think that owners of ZX computers can rely on *Sinclair User* for important and entertaining monthly news.

Prabhoo Janabalan,
London E9.

AGF

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With every order comes a free demonstration program called 'Video Graffiti' plus a full set of instructions.

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- Programmable Interface Module as illustrated, complete with clip-on programming leads.
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- One pack of ten Quick Reference Programming Cards for at-a-glance setting to your games requirements. The card allows you to mark the configuration in an easy to read fashion with space to record the software title and company name.
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- 12 months guarantee and full written instructions.

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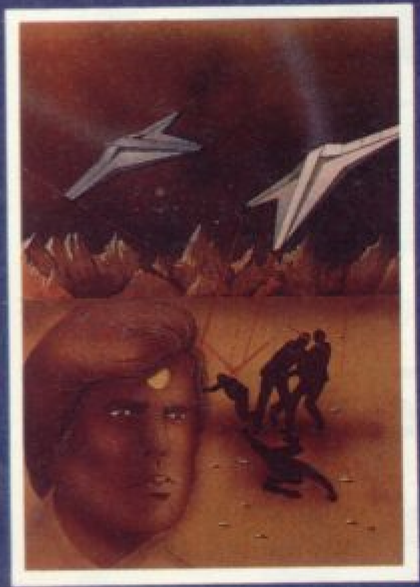
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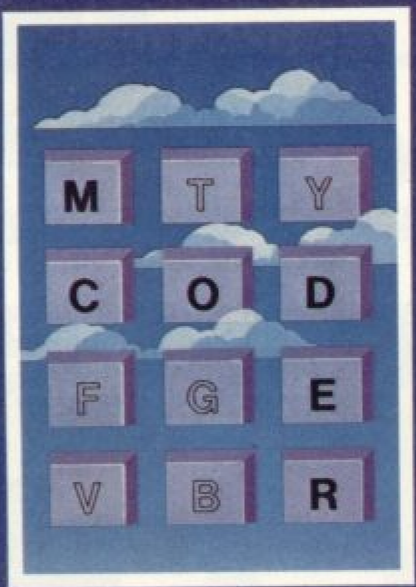
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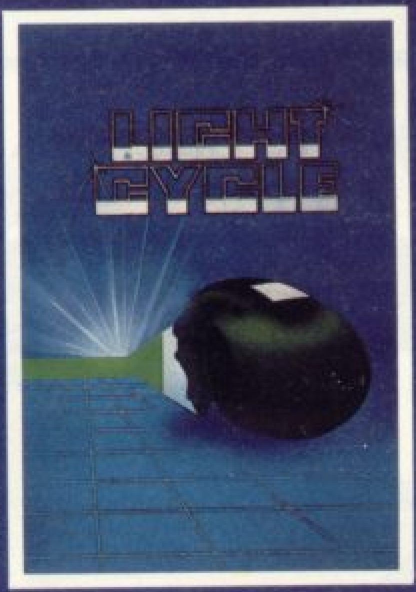
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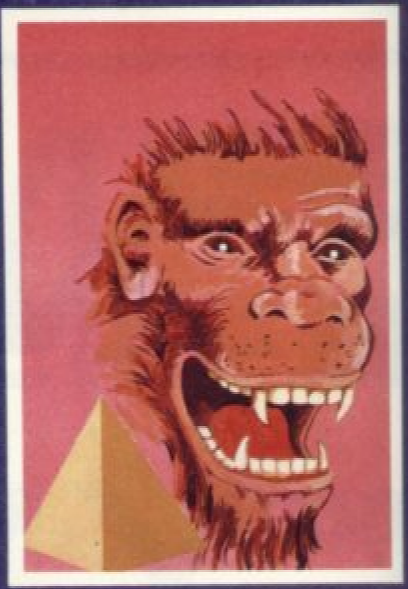
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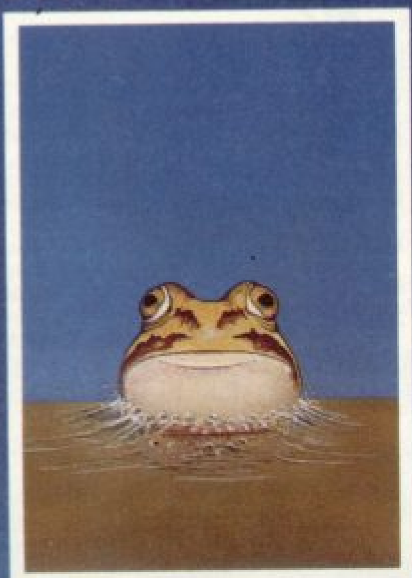
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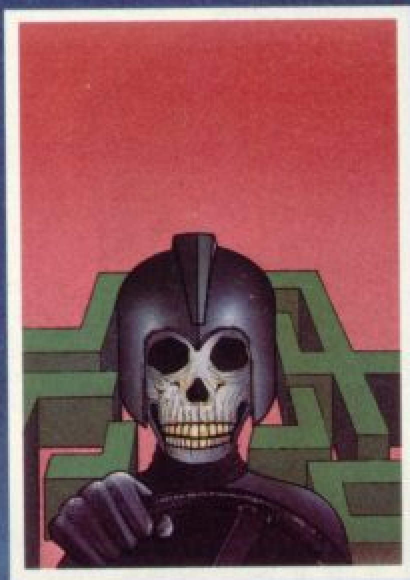
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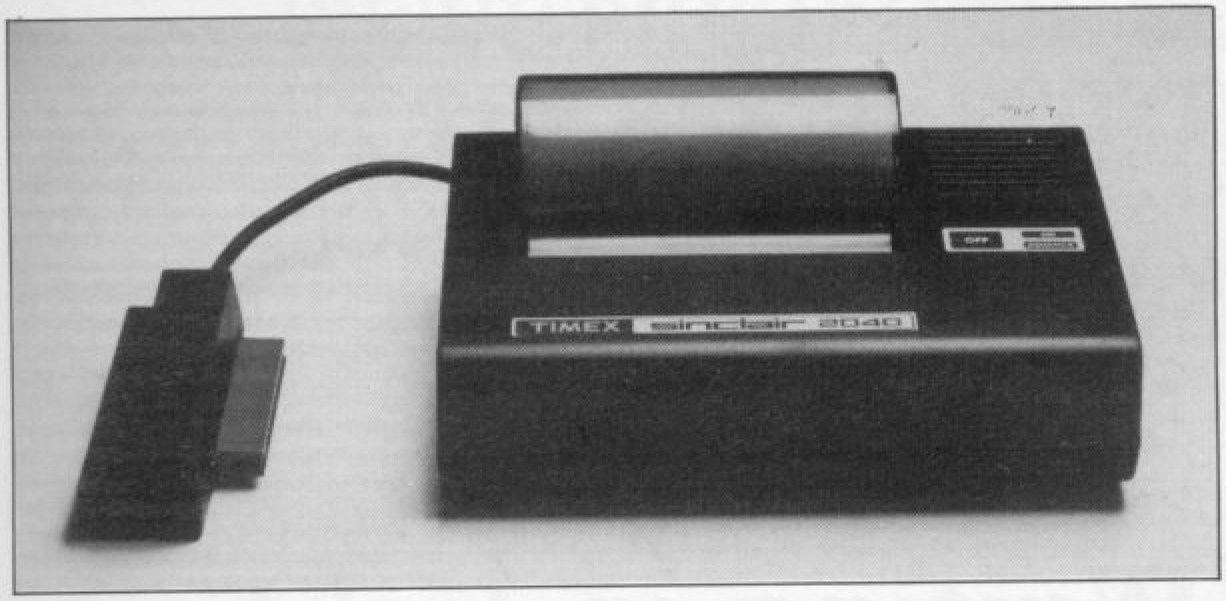
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Timex makes a clearer printer

THE TIMEX 2040 thermal printer is the standard printer used with the American version of the ZX-81. The U.S. version of the Spectrum had yet to appear at the time of writing. It works with a different paper, 4½in. wide plain white paper with a special coating sprayed on to the top of it. The coating turns black when heated, giving the impression of ink on the paper. It is much clearer and there is no difficulty with the paper sticking.

The case is 7¾×5¾×3½in. high in moulded black ABS plastic and has a 6in. long cable at the back on the left-hand side. The connector to the end of the cable is bigger and more solid than the Sinclair version, having a half-inch hump at the top.

That hump contains two ferrite rings around the cable to reduce TV and radio interference and an interface IC — 74LS10. That IC helps to decode A7 and A2 instead of only A2 on the Sinclair version.

The case also has a metal comb protruding under the edge connector which prevents the edge connector wobbling and, presumably, the RAM pack, too.

Also on the back of the case is a power socket like that of the Spectrum but it requires 25V AC to run the printer. A transformer is supplied in a plastic case 2½×3½×2¼in. with American-type power prongs on the back. There is no fuse or ventilation on the power pack and thus it becomes reasonably hot but it has not failed yet. The Sinclair printer is, of course, supplied through the computer and thus needs no extra power supply.

Inside the printer there are two regulators, one a transistor arrangement for the 25V DC supply to the heated pads which do the printing and a 7805 IC of the ZX-81 type fitted into a large heatsink and situated under a ventilation slot in the top. The power supply is set for 110V AC and therefore should not be used without a stepdown auto-transformer to convert the voltage from 240V supply.

There are two switch pads mounted in the top of the box which push two flat switches mounted on the PCB underneath; they turn the printer on and off. Pushing the off button while holding-down the on button puts the printer into a self-test mode, printing alternate lines of 1s and 8s independent of the computer.

The other electronics inside the printer are five driver ICs, one for the motor and four for the heated pads. There is also a pre-programmed ROM 8741 which controls all the printer operations.

The pads on which the printer depends are spring-loaded on to a rubber platen, like a typewriter, and are made of some ceramic material on which 20 copper wires have been plated. There are two pads and each wire will print over one character area, so theoretically there should be 40 characters but you get only 32. The pads move from side to side while printing, controlled by a nylon gear arrangement, so that 32 dots are printed at one time.

The printing head is then moved on to the next 32 until all eight dots on each character line have been printed before moving to the next line. The printing speed is very fast; on self-test you can print 124 lines a minute.

The paper roll used in the printer is inside a perspex cover and the start of the paper is pushed under the platen; the on button is then pushed to feed through the paper. The paper appears on the outside of the paper-holder on the other side of the ¼in. platen. The platen cannot be pushed in reverse, so the only way to free jammed paper is first to cut it and then push the platen forward, using the motor drive if possible.

The printer is considerably easier to use than the Sinclair one and the paper is much cheaper at $1.50 (£1). The printer costs $99. The one tested was sent by a friend in the U.S. and it cost $99 plus $23.90 postage — £81.67 — plus £14.13 Customs duty, a total of £95.80.

More hardware page 24

Spectrum 32K rampack

CHEETAH MARKETING has produced a 32K RAM pack for the Spectrum. It allows the 16K user to add 32K of memory without having to go inside the computer. The front of the RAM pack is designed to fit tightly on to the back of the Spectrum and an expansion connector is provided at the back for Microdrives and printers. You must plug in the RAM pack only when the power is off.

When you turn on the power again you have a full 48K just as if it was inside. The RAM pack does not wobble and apart from the fact that it protrudes over the back of the Spectrum, you would not know it was there. Cheetah gives only a three-month guarantee and you must pay a handling charge of £1.50 if you return the unit for repair.

Cheetah Marketing is at 359 The Strand, London WC2 0HS. Tel: 01-240-7939. The cost of the RAM pack is £39.95.

EPROM toolkit

ROM V is the latest in a salvo of solid state software as the Americans call it — EPROMs — from Eprom Services. It contains a disassembler in a 2K EPROM for the ZX-81. It requires an EPROM board to fit it into but any one will do so long as it allows the EPROM to reside between 8K and 10K.

On RAND USER 10000, it displays a menu of the six commands. All the commands have a description of its use and the letter to use for that command. It can disassemble from any address, including that of its own ROM, print-out or COPY the disassembled program — the printout goes on past a full screen — or jump back to the start of disassembly.

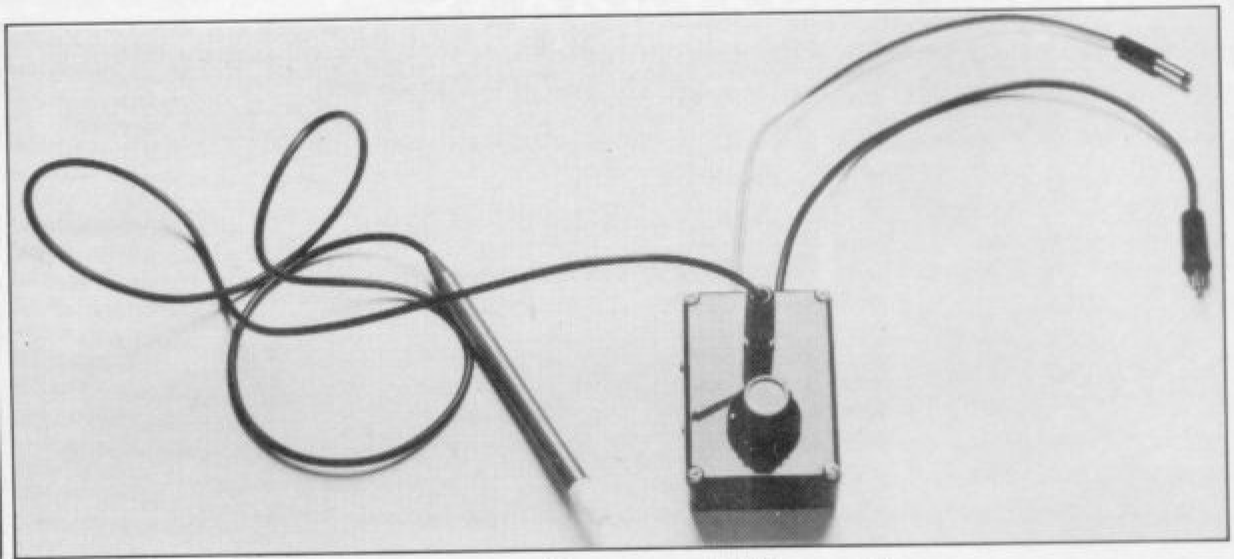
Pressing any key brings up a new screen full of disassembled mnemonics with their hex equivalent and address on each line. All information is put in as hex numbers; decimal is not accepted.

It provides a very useful facility in ROM which is a good aid when faulting or checking a program. It uses no memory apart from the screen and therefore can be used on a 1K machine or a 16K version; being EPROM it is also crash-proof.

A break or Q key can be used to return to Basic at any time. Eprom Services is at 3 Wedgewood Drive, Leeds LS8 1EF. Tel: 0532-667183. The ROM V costs £10.

ZON-X is now fully-decoded

BI-PAK says that its Spectrum version is fully-decoded and checks that none of the Sinclair devices is working before operating the ZON-X sound board, including the Microdrive. The confusion arose because of the manual description, which was out-of-date.



Writing in light makes input easier

THE SPECTRUM Lightpen by dK'tronics is a kit consisting of a tape, light pen with a 3.5mm plug on the end and a black plastic box. First you run the tape into the Spectrum; the 48K side unfortunately has the 16K version on it and vice versa so if you get out of memory, pull out the plug and start again on the opposite side of the tape.

The program loads a Basic instruction program which then loads a machine code program above RAMTOP. All goes well to that point. The instructions on the screen then warn you to plug the light pen via the control box into the computer. The power lead must be diverted through the box when you power-up the computer but the light pen must be disconnected while LOADing or SAVEing. The list of instructions is vast and all letter-coded.

Choosing a letter from the menu gives the instructions associated with that letter. Having gone through the instructions, you have to set up the delay for the screen. That is the first bit of machine code and immediately crashes the program on the 48K version. On the 16K version there is no list of instructions — they are listed in the manual.

The light pen works well; it reacts with the instructions satisfactorily. The position of its reaction can be adjusted up or down by a knob on the top of the unit. That varies the pulse sent to the EAR socket by the black box.

dK'tronics light pen costs £21.20 and is available from Unit 2, Shire Hill Industrial Estate, Saffron Walden, Essex CB11 3AX. Tel: 0709-236350.

Versatile controller

THE PICKARD controller is a plastic box through which you can connect an Atari-type joystick to the Spectrum or ZX-81 keyboard. That allows you to specify which key the joystick will operate by a set of plugs on the top of the unit which represent the joystick position.

They plug into a socket — just like a MIC socket — which represents the key you want to operate. That permits you to work a program through the joystick now, or in the future. It also provides you with other uses such as quick editing, having the computer react to outside events by plugging-in a switch instead of the joystick plug, and many other things.

The unit plugs into the keyboard sockets of the computer and into the power socket of the ZX-81 or Spectrum — you must state which when ordering. The power unit then plugs into the joystick box. The keyboard leads plug into a keyboard socket on the top the keyboard plug but that may be changed so that you do not have to remove the keyboard leads.

Difficulties with the unit were caused by what appeared to be careless construction.

According to the supplier those checks will be tightened and the review unit appeared to be a rogue one. The unit is also being changed to make it easier to construct, which at present is a time-consuming operation. It is a very good idea; once the unit was soldered-up it worked perfectly. Once the construction problems have been solved, it should be a winner.

The unit is marketed by Success Services, 154 High Street, Bloxwich, Walsall, West Midlands WS13 3JT and costs £20.45 for the controller and £7.50 for the joystick. You must state on which machine you want to use it.

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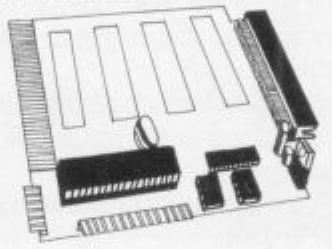
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Damping-down lively cables



FEW NEW GAMES for the ZX-81 have been released recently. Only two of the major software companies have continued their range of cassettes for the machine. The first is Quicksilva, which has launched a new batch of games for the 16K ZX-81. They include a cassette containing two arcade-type games and two adventures.

The first game on the arcade tape is **Damper.** The player takes the part of a grid damper who must turn off the power on a grid before some evil leeches do permanent damage to the power cables.

To attack the leeches you must trace round the squares which make up the grid. When you have completed a track round a square it will turn black as the power runs down in that sector of the grid. If the leeches catch your player you will have an electrifying experience.

The game includes a hall of fame. The only problem is that you are usually dead before your name is entered with the others of the elite of grid runners.

Damper is an original and excellent game and includes some stunning graphics.

Also included on the tape is a Pac-man-type game, **Glooper.** There are seven levels of play and the seventh is very fast. The ghosts which inhabit the maze are intelligent, for a change, and they will always get the Pac-man on the most difficult level. Both games are available on cassette for £4.95.

The first of the adventures from Quicksilva is **Pioneer Trail.** The year is 1842 and you and your family join the pioneer trail to Oregon from Westport Landing, Missouri. You have 40 weeks to cover 2,000 miles and all you have for support is two tired horses and a wagon.

At the start of the game you have $700 which you can spend on oxen, food, bullets, clothes and supplies. You can use the bullets to hunt or you can drop into the local fort for extra supplies on the journey. Along the way you will meet Indians and have to fight your way through thick fog and blizzards.

Pioneer Trail costs £3.95 and includes both adventure and arcade graphics.

The other adventure is **Ocean Trader.** The game is again set in the 19th century. You are the captain of a 130-ton sailing barque who must gain £500,000 before the game is completed.

You can hold 50 units of cargo aboard the vessel, including arms, coal, whisky and bullion. The arms and bullion are, of course, illegal and will have to be jettisoned if you encounter trouble and have to return to port. The dangers of your voyages between the ports of Liverpool, London, Newcastle and Southampton include sea mists, pirates and freak storms. There is also the danger of having to pay the loan for your ship when you have no money. If that happens you could lose your ship. Ocean Trader costs £3.95. All these games are available from Quicksilva Ltd, Palmerston Park House, 13 Palmerston Road, Southampton.

Tempestuous action from Mikro-gen

MIKRO-GEN is the other company which is still retaining games for the ZX-81 sector of the market. Its releases include an excellent version of an arcade game called **Tempest** for the 16K ZX-81.

Your ship is at the top of the screen and a host of invaders shoot across from the right-hand side. You have to destroy them without hitting the missiles which are launched against you or the devilish spikes which trail behind the spinners.

The game is played through different levels or sectors. When you have destroyed all the aliens in one sector your ship will move to the right of the screen and into the next sector.

The playing level numbers are arranged in odd order, as the most difficult level is one and the easiest is five. Level one should be used only by those who want to wear out their laser fingers and the keyboard at the same time. Tempest costs £3.95.

One of the cassettes in the range is for the 1K ZX-81. It contains three games, **Impact, Target** and **Death Ray.**

Impact uses a full-screen display and, surprisingly, the game has a title page. The aim is to steer your spaceship through an asteroid storm. It may not be very original but for a 1K game, written in Basic, we must give credit where it is due.

The second game is Target. You have a limited period in which to hit as many targets as you can, using your gun. You have to align the gunsight over a target and the gun fires automatically, destroying the target.

The last game is Death Ray. It imitates space invaders but the aliens do not play fair. You can fire your gun only vertically but they can fire vertically and diagonally. The Games Pack for the 1K ZX-81 costs £3.95. We have not seen a city bomber game for the 16K ZX-81 for a long time, so when **Bomber** arrived to be reviewed we did not know whether to laugh or cry. The game is below the standards which we have expected from companies producing ZX-81 software.

The bomber aircraft in question moves across the screen from left to right. The player must drop bombs on the city below to clear a runway on which to land. If a finger is kept on the rocket button it is not difficult to level the skyscrapers which stand in the way. Bomber costs £3.95.



On Knight manoeuvres

IN KNIGHT'S QUEST, a graphics adventure for the 48K Spectrum, you can go boldly where no knight has gone before. The object is to find Merlin's lost treasure. On your way you will encounter scorpions and dragons, battle with elves and rescue a princess from the wicked Wizard of Trill.

The game has more than 120 locations and many are underground. A graphics representation of most of the locations is shown in one corner of the screen and the use of machine code to speed the game when transferring from one location to another is apparent. **Knight's Quest** is definitely a game for all who like dungeons and dragons adventures.

Phipps Associates, manufacturer of Knight's Quest, also has a 16K version of the **Nowotnik Puzzle** for the Spectrum. It is fully machine-coded and involves the player trying to out-think the computer in moving an 'L' shape round the playing board. The person, or machine, who cannot move the 'L' loses the game.

Both games are interesting. Knight's Quest is available for £5.95 and the Nowotnik Puzzle for £4.95. Both can be obtained from Phipps Associates, 99 East Street, Epsom, Surrey, KT17 1EA.

Meet Evil Orville the invincible ball

THE LATEST Spectrum releases from Quicksilva bear a striking resemblance to original arcade games. The new offering is **Astro Blasters** and looks like a cross between two arcade favourites, Phoenix and Avenger.

Your spaceship is at the bottom of the screen and a squadron of alien birds wing their way through space, dropping clusters of bombs on you. If you manage to survive two attack waves, your spacecraft will run into a meteor storm which is sure to destroy it. The game is very colourful but the illusion of travelling through space is spoiled because the stars seem to appear on the screen at random and there is no scrolling effect as you move through space.

The second game is **Frenzy** and it looks like the arcade game Berzerk. You are in a maze patrolled by evil robots, a wandering ball called Orville and a mine-layer.

The robots can be destroyed but your laser gun will fire only in the direction in which you last moved. That can be awkward at times but it adds to the fun.

You will not be able to kill Evil Orville, so if you meet him it is best to dodge out by one of the four exits in the maze. You must also be careful not to step on the mines.

Astro Blasters and Frenzy are both available for the 16K and 48K Spectrum at £4.95 each.

They can be obtained from Quicksilva Ltd, Palmerston Park House, 13 Palmerston Road, Southampton.

Over-complex baby grow

SOME SOFTWARE houses seem determined to dispense with paper and pencils. They are overwhelmed by the excitement of new technology and do not stop to think whether the jobs they are asking computers to do would be better done by a few simple calculations.

The latest company to offer something of the kind is Medidata with its **Cycle Planner** program for the 48K Spectrum. It analyses menstrual cycles, working-out the most recent cycle, the next period date, the maximum fertility date and what the company calls unsafe dates. Also when conception occurs it can predict the most likely date of birth.

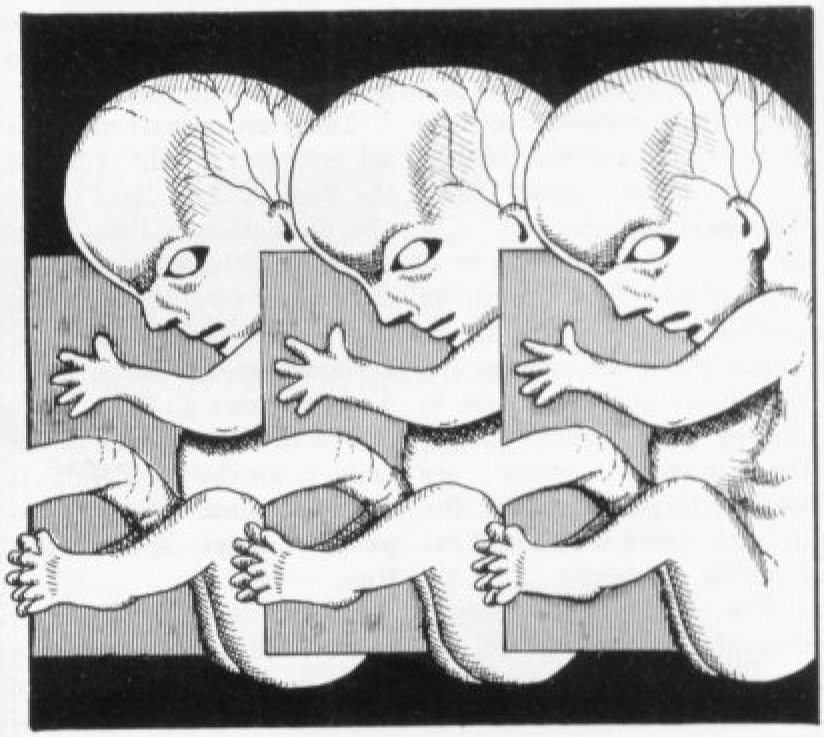
As the program has been designed to be used by beginners to computers, the chances of entering errors are small.

The information obtained is worthy and well-presented but could be determined with the same degree of accuracy in the time it takes to load the cassette. On the other side is **Growth Tracker,** a menu-driven database which estimates the growth of a baby before birth and for the first 24 months of its life.

It also shows the common illnesses which can affect young children, with their treatments.

The cassette costs £7.25 and Medidata says that its aims are as an aid to women and also to introduce more people to computer technology.

Both aims are commendable but there are cheaper and less complicated ways of doing them. Medidata is at PO Box 26, London NW9 9BW.



Musical education aid

ALL SPECTRUM owners now have the chance to name that tune or, in this case, name that musical note with the Software Cottage **Firework Music.**

The software is part game and part adventure into education. You have to guess the name of a musical note which is drawn on the screen using high-resolution graphics. You cannot take all day with your guess, because a spark descending into a box of fireworks sets the time limit.

If you make a correct guess you are awarded one firework in the box. If you run out of time the spark will reach the box and all those fireworks will go off with a bang. During the game you can have three boxes of fireworks and if you collect sufficient rockets you will be treated to a display which would equal any on November 5.

The game can be easy. All you have to remember is the EGBDF and FACE lessons which are usually taught to every schoolchild.

Firework Music is an ideal teaching aid for young children learning the rudiments of musical theory. It also uses a good psychological approach with a rewarding display at the end of the teaching session.

The game is available from Software Cottage, 19 Westfield Drive, Loughborough, Leics., LE11 3QJ. It costs £5.



Lacking imagination

DESPITE the glossy advertisements, Spectrum games from Imagine Software seem to be only average. The first program to be released is **Arcadia.** The player controls a spaceship at the bottom of the screen and waves of enemy fighter swoop in, dropping bombs. There is a series of levels to the game and on each level the spaceship Arcadia faces a different foe.

The colour and explosion effects in the game are unusual and the range of space invaders was interesting but the game lost its appeal after a few hours and became just another version of beat the evil nasties.

The second game also gave a good first impression but that wore off after play. The game centres on a black hole which sucks in all the garbage of the universe. The player controls an inter-galactic refuse collector.

The rubbish is displayed as three-dimensional cubes and pyramids and the collector must push it into the black hole. If the collector gets too near the black hole it will be sucked in.

Both games are for the 16K and 48K Spectrum and cost £5.50 each. They can be obtained from Imagine Software, Mason's Buildings, Exchange Street East, Liverpool, Merseyside, L2 3PN.

Playing its cards wrong

MICROMEGA, known for its selection of 1K ZX-81 games, has launched into the Spectrum market with a series of games which will work on both machines.

Monte Carlo is a cassette with two games on it. The first is **Blackjack,** in which you must try to break the bank – your computer opponent. The simulation has good graphics and the computer plays well but the reason for putting yet more card games on to a computer, especially one of Spectrum potential, is difficult to appreciate. To give the cassette a fair run for its money we moved to **Craps,** an American dice game in which you must throw a 7 or 11 on the first throw to win. If you throw a 2, 3, or 12 you lose.

The game is excellent and very difficult to beat but the same criticism can be made as for Blackjack. It would be better to have a pair of dice and throw them instead of waiting for the computer to load to program to do it.

The second Micromega Spectrum cassette is a little more taxing on the mind and demands more concentration. **Dominoes,** so far as we know, is the first simulation of the game to be put on to a computer.

The simulation is good and so are the graphics but, unfortunately, the same can be said as about the first cassette. It is difficult to understand why traditional card and dice games are put on to a computer time and again. There are already hundreds of versions of Blackjack, Pontoon, Twenty-one, and Craps available for Sinclair machines.



New concept in empty space

THE MANUFACTURER of **Black Hole,** for the 16K and 48K Spectrum, claims that the concept of this space game is completely new. So far as we can tell, the claim is not exaggerated.

The player must move around a black hole using positive and negative ion guns and a neutron blaster to destroy the hordes of aliens which spin and slide down the screen with terrifying speed.

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The game has a learning mode in which you can practise your destructive talents. That mode contains no score and your spaceship will not be destroyed as in the play mode.

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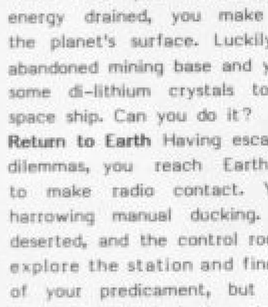
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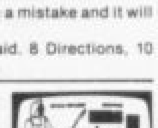
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Plenty for experts and beginners

Brian Stokes looks beyond the first impressions of the Welsh machine

ON FIRST impressions, somebody wishing to buy a computer may think that the Dragon is nothing but an upgraded ZX-81.

The bland green and black screen display which appears on power-up shows none of the real power of the machine. The full-size typewriter-style keyboard may appeal to buyers but it is not until the programmer has worked with the machine for some time that its true potential is realised.

The computer uses Microsoft Basic which, in many ways, is superior to Spectrum Sinclair Basic. Some of the commands, however, such as IF ... THEN, are extended to make the language more powerful.

The Dragon has two sockets for joysticks and a Centronics interface for a printer, all of which are controlled using Basic commands. The machine uses an ordinary cassette recorder which should have a remote socket. The recorder motor can then be controlled by the computer, also using Basic instructions.

Unfortunately the sound levels of the cassette recorder need to be set very precisely or tape errors will begin to occur. The machine we reviewed would normally take only new, clean cassette tapes but once the correct recording level was determined, cassette operation caused no more difficulties.

It may seem strange that word processing can only be done using the Dragon, as the machine displays upper-case on the screen; but lower-case mode is available to a printer. When in that mode the Dragon will display all characters in inverse video, with green lettering on a black background.

The computer also has print formatting commands built into its version of Basic. They enable the programmer to specify how numbers and strings are displayed and can be used to create neatly-tabulated lists of figures. The formatting commands are exceptional on a computer which costs less than £200.

The Dragon can produce only one sound at a time from the loudspeaker of a television set. Tunes can be programmed by using a string of letters, from A to F, in quotation marks, after the PLAY instruction. When the program line is executed each note within that string is played in turn.

> 'It is assured of a growing slice of the market'

That is a good solution to the problem of producing tunes easily. It means that a fairly lengthy tune can be played by using only one line of program instead of many BEEP commands or long data lists on the Spectrum.

When LOADing and SAVEing on cassette with the Dragon the computer provides an AUDIO ON and AUDIO OFF set of commands to allow the user to hear the tones being produced during the procedures. Those commands are useful for monitoring the quality of a tape or ensuring that no errors occur during SAVEing on to cassette.

Although the standard Dragon has no user-definable graphics capability, one of the most outstanding things about the machine is its graphics abilities. The computer has a set of low-resolution block characters, similar to those on the ZX-81 and Spectrum, which can be accessed using the CHRS command and the code number of the graphics character which is needed.

High-resolution graphics screens are called pages and special video RAM can be reserved within the machine for a certain number of them. Usually there are four pages which can be flipped through under program control to create an animation effect on the screen.

Each frame is put on a separate page and a page can be brought to the screen at any time using a simple Basic command and what is essentially an index number. The execution of the graphics commands is extremely fast, so good arcade-type graphics effects can be achieved without having to resort to machine code.

There are five resolution grids available on the Dragon screen. They range from a density of 128 × 96 pixels to 256×192 pixels. The highest resolution will allow only two colours at the same time. They can be a combination of black and green or black and buff.

It is possible to draw lines and circles on the screen. The co-ordinates used in the line-drawing commands do not have to be offsets of the last line drawn, as on the Spectrum, but the LINE command on the Dragon is just as complicated to use. It is also possible to draw in the same way as on the Spectrum, except that you specify two extra points in the CIRCLE command and the colour in which you want to draw the circle.

The Dragon certainly offers plenty to both the beginner and the expert programmer. The machine has been maligned in the past but has gained steadily in popularity since before Christmas. What deters most people is the price, which could be reduced to make it more competitive, and the fact that on first impressions the machine does not have exceptional appeal.

While the Dragon is not in the same price bracket as the Spectrum, it is a competitor for public favour in the microcomputer market. More back-up is beginning to filter through for the machine, especially from overseas, and the Dragon is assured of a steadily-growing slice of the market in the foreseeable future.

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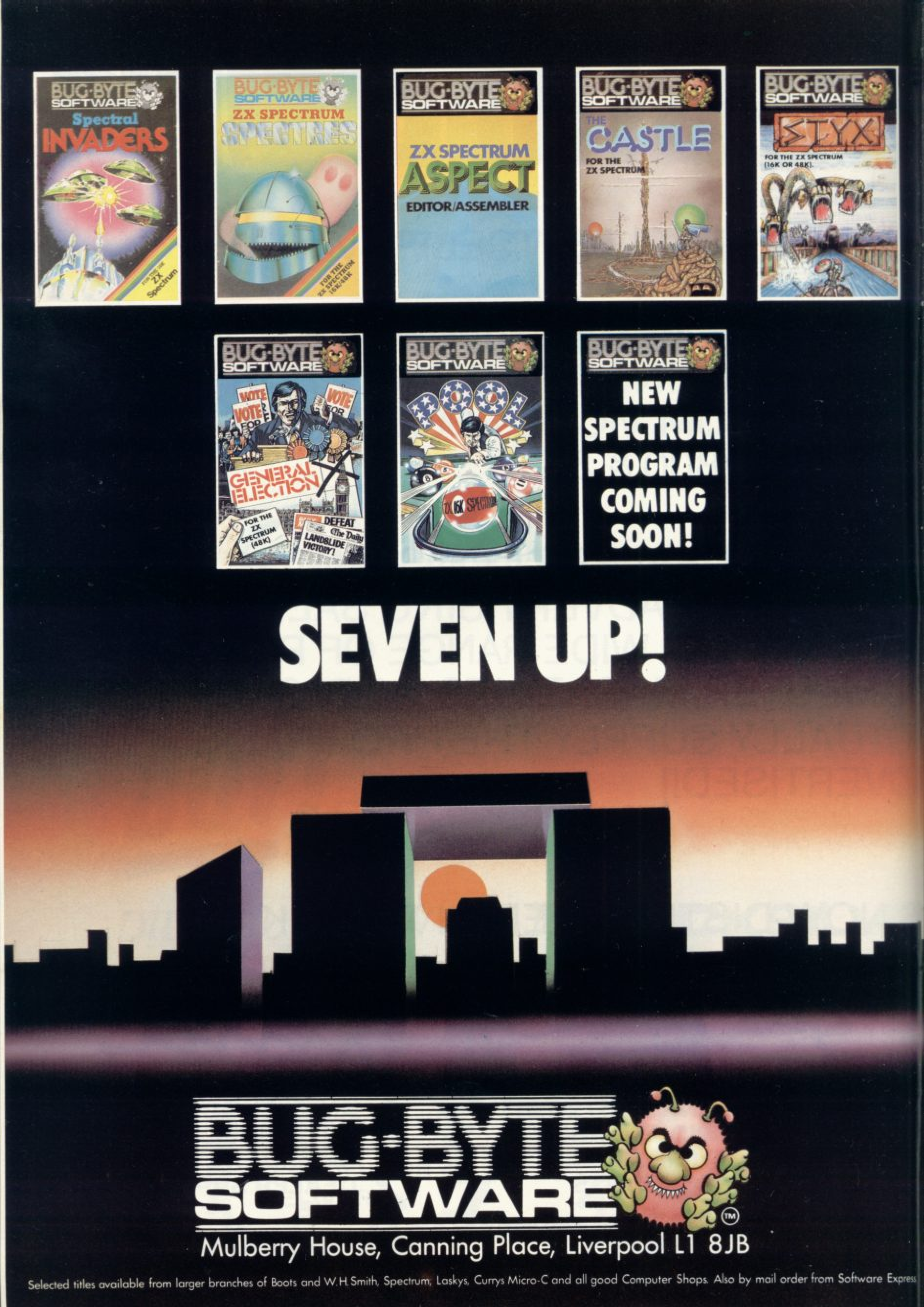
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Writing programs is time-consuming. John Gilbert examines a collection of cassettes which help to make the job much simpler

The easier route from Basic to machine code

THE BEST WAY to learn about machine code is to use an assembler. Machine code consists of numbers but with an assembler the user can write code in assembler language, which looks more like Basic and is easier to understand. The program will then convert the user's assembly language instructions, called source code, into machine code.

Although the ZX-81 has been around for several years there are only a few machine code assemblers available on the market for it. The only big companies to produce assemblers for the machine are Artic Computing and Bug Byte. Both built their reputations with these assemblers.

The Artic assembler is a two-pass program. It will permit full use of labels, will inspect and modify registers and also allows output to a printer. The code to be assembled is put into a REM statement at the beginning of the program and all code can be written in standard Z-80 mnemonics. The assembler will also assemble messages which are to be used in programs into hexadecimal code. It costs £9.95.

The other best-seller is the Bug-Byte ZXAS. The program is similar to that of Artic but was launched in a blaze of publicity as being the first machine code assembler for the ZX-81.

Bug-Byte also wanted to be the company which produced the first assembler for the Spectrum but it was to be disappointed. Wrangling within the company between its programmers put the release date further and further back until the package became available early this year.

The program is for the 16K and 48K Spectrum. It is very comprehensive in its options and very easy to use. As well as assembling user machine code, it has a full editor facility with which the user

continued on page 38

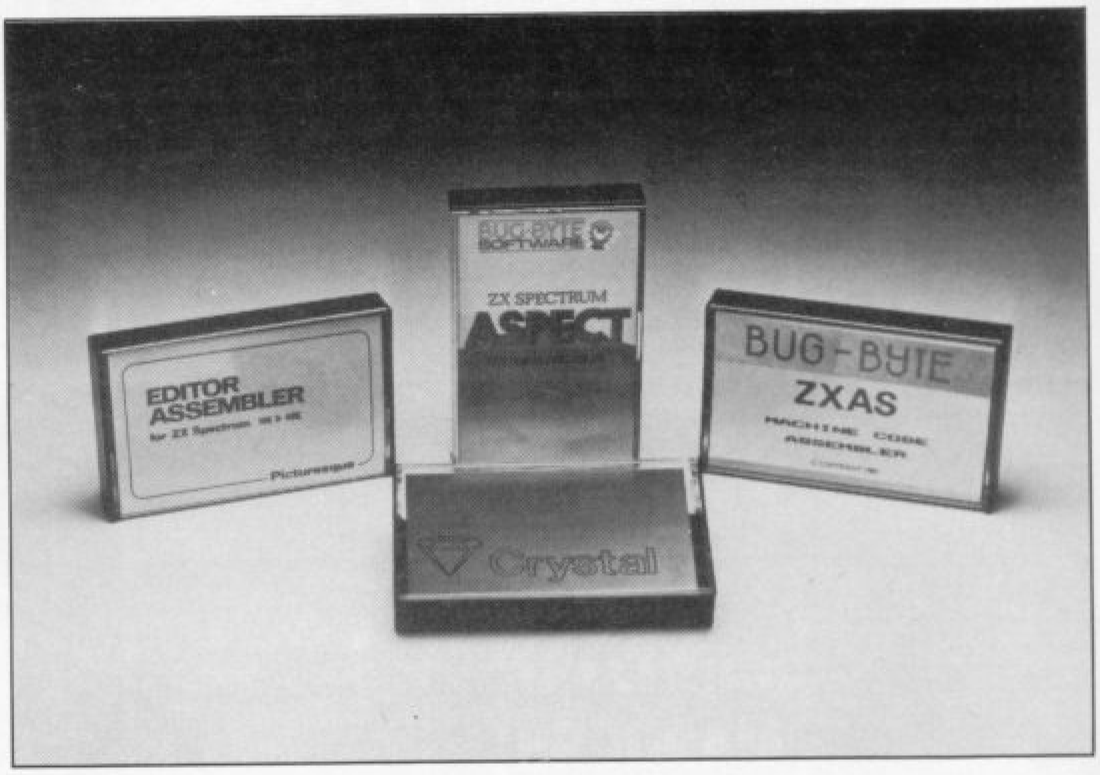


continued from page 37

can view assembly code, delete and insert, search for specific strings of text within machine code, and list all the labels which have been specified by a user in a program within a cross-referenced table.

The editor will also reverse 16-bit values, such as memory addresses, if the user specifies that option. That facility is useful when dealing with a large number of 16-bit addresses in a long program. The use of 16-bit values can be a problem for beginners, who often do not know whether or not to reverse a number.

The program also has a good cassette interface. Both the source code — the user's — and the object code — assembled-code can be filed on to cassette. That means that source code can be saved and re-edited when the user needs it. The saved source code could also be useful if the programmer wanted to upgrade a program.



Unfortunately the manual, or lack of it, provides points against Aspect. Instructions are written on a piece of paper. They are just about adequate and contain no examples. Aspect costs £9 and is available from shops such as W H Smith.

Picturesque slipped its Editor/Assembler on to the market very quietly. The program is for the 16K and 48K Spectrum and is very powerful. It is complete with a comprehensive user manual which a complete beginner can understand.

'One of the most powerful assemblers which we have reviewed is produced by a small, and largely unrecognised software house, Crystal Computing'.

The Editor is the part of the program which enters the source code. It is possible to enter code in the same type of format as a Basic program, as each line is given a line number. Unlike the Basic system on the Spectrum, line numbers can be generated by the program automatically with the use of the AUTO command. The use of line numbers means that the source file can be edited quickly and easily.

When the source code has been entered correctly and there are no bugs in the text, the assembler can be called into operation. The usual ORG instruction is included as part of the instruction set to define the address at which the assembled code should be put.

The program display is interesting, as the screen has a 40-column width and is split into several fields which correspond to those used in assembly language programming, together with a line number field. The cursor recognises the end of one field and jumps to the next automatically. That makes the entered source code easy to understand.

The Editor/Assembler is ideal for the beginner and could also be a powerful tool in the hands of a professional programmer. It costs £8.50.

The program which has caused a buzz of excitement in the *Sinclair User* offices is probably one of the most powerful assemblers which we have reviewed. It is all the more remarkable as it is produced by a small and, until now, largely unrecognised software house, Crystal Computing.

The program, Zeus, is a two-pass assembler which allows the use of the full Z-80 mnemonic instruction set. Source code can be line-numbered and an AUTO line-number facility is also available.

The program is accompanied by the best manual we have seen for an assembler. It contains step-by-step instructions for entering and editing source code. An example is included which will, if entered correctly, colour the screen white, the current ink colour.

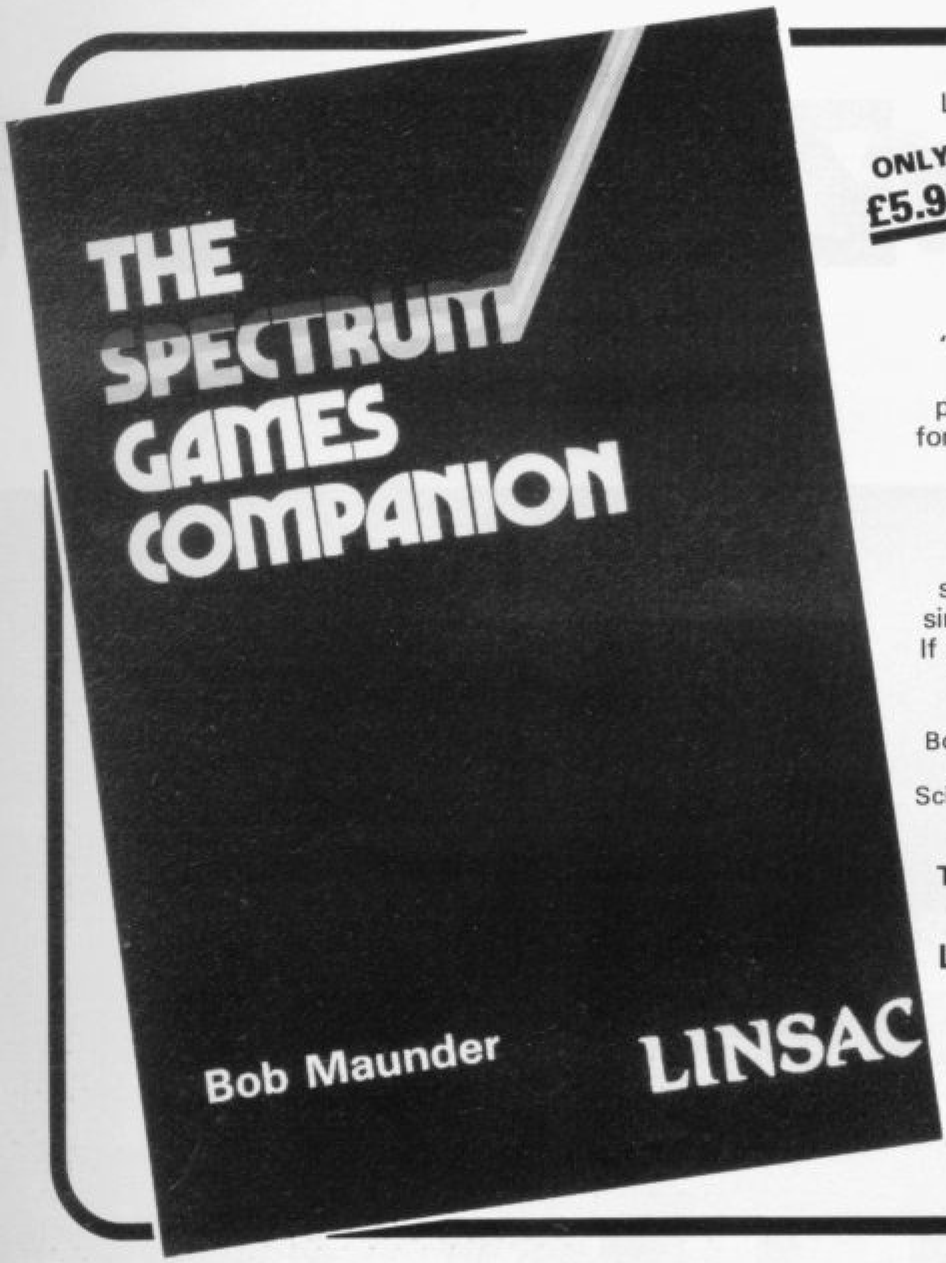
The use of an example in that way is good, because if you make a mistake and the program does not work you will have to re-learn the instructions. If the example works, users will have a good understanding of how Zeus operates.

Zeus also contains several subroutines which can be used within source code. They include an INKEY$-type function and print a character routine. Other functions in the assembler include automatic re-numbering of the source file, outputting of code to a printer, and the reclaiming of 'old' source files for further work. Zeus has been aptly-named by Crystal Computing. It costs £8.95.

There are very few good assemblers on the market although the big software houses all claim to have the best available. It is, therefore, surprising that a small company like Crystal should produce such an excellent assembler as Zeus. The reason may be that while large companies spend their money on colourful advertising, smaller companies need to rely on very good quality products.

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Bob Maunder is co-author of 'The ZX80 Companion' and author of 'The ZX81 Companion'. He is a Senior Lecturer in Computer Science at Teesside Polytechnic, holds an MSc degree in Computer Science, and is a Member of the British Computer Society.

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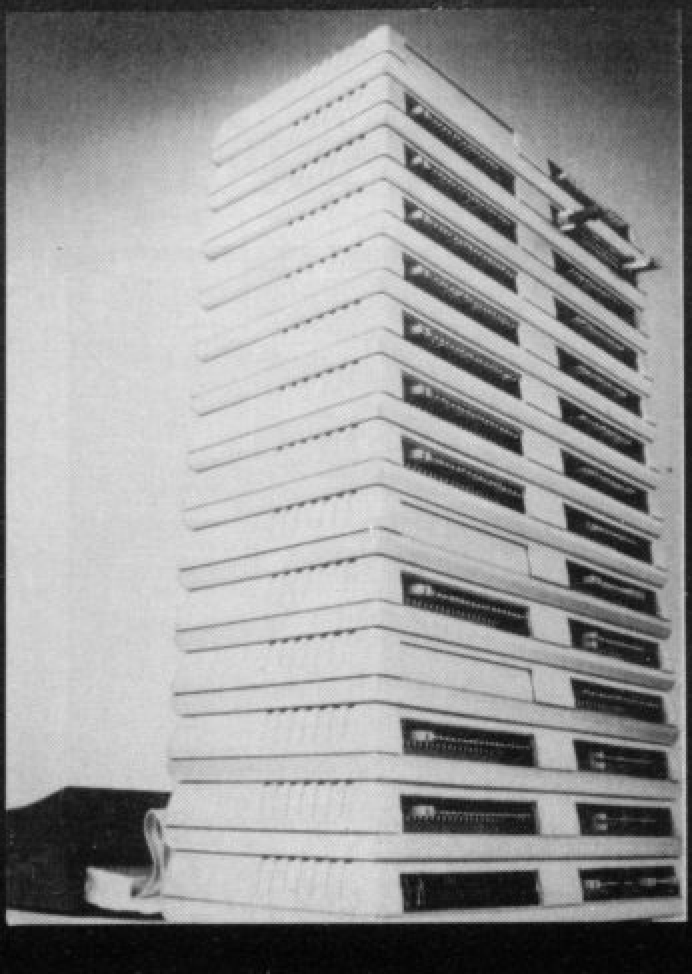
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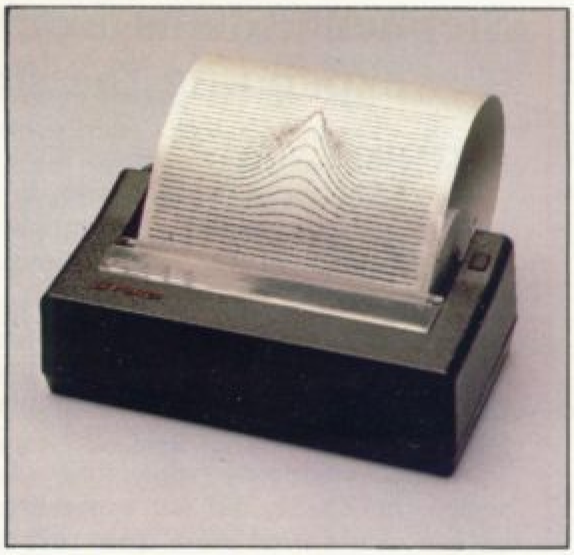
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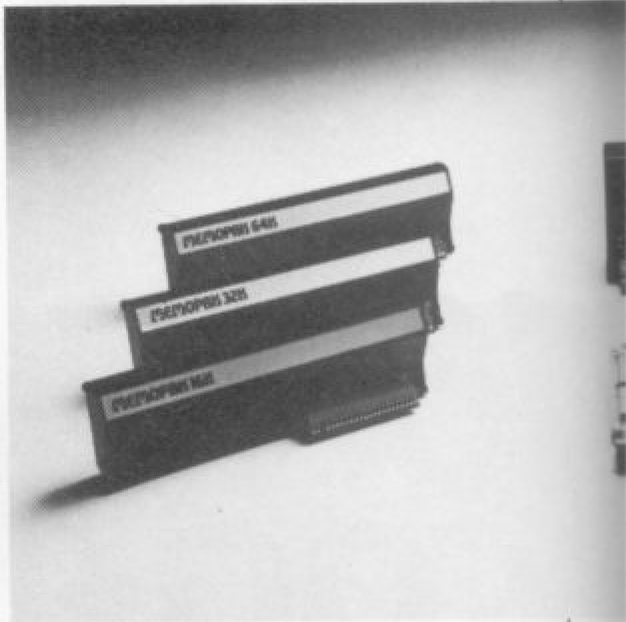
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Cheap is not nasty in memory packs



Stephen Adams examines the many ways of expanding the storage of the ZX-81.

THERE ARE so many ZX-81 RAM packs around these days that it is worth looking at what they can offer in the way of more facilities.

First, a little explanation of the ZX-81 memory map and ROM routines would help in understanding the limitations of the ZX-81.

Sinclair engineers, when they designed the ZX-81, did not expect that anyone would need more than 16K of RAM. So they took some short cuts in the design which made it cheaper and easier to access the RAM and ROM. One of the them was to restrict the upper 32K of the memory map to working the screen and nothing else. The other was that the ROM, which is only 8K long, was allowed to repeat itself throughout the memory map unless the RAM was working in that area.

Those decisions allowed them to decode only the top two ADDRESS lines—A14/A15—to determine whether RAM/ROM or RAM with DISPLAY was on at any one time, the address line A15 deciding whether the display was on or not and the display being on only in the top 32K of memory and thus dividing the memory map in half.

The A14 address line divided each 32K section into two quarters, the bottom half of which was ROM and the top half RAM. As they were the only decoding done inside the ZX-81 the 1K of RAM repeated itself all the way through the 16K RAM section.

Memory map of the ZX-81

Address	Contents
64K–48K	RAM for display—display file
48K–32K	ROM appears again
32K	1K or 16K RAM
32K–16K	1K or 16K RAM
16K–8K	ROM appears again
8K–0K	True ROM area

When the 16K RAM pack is added, however, it is switched-off by the use of the RAMCS line on the edge connector and the RAM chips in the RAM pack do all the extra decoding necessary to divide the 16K section into individual bytes.

To expand the memory above 16K required some special decoding in the RAM pack so that it did not interfere with the display, which needs a repeat of the first 16K of RAM at 48K and above in the memory map.

It also required that the ROM be restricted to the first 8K of the memory map. That was done by using the ROMCS line in the same way as the RAMCS was used on the 16K RAM pack. Memotech was the first company to produce a 56K RAM pack. Most of them are now called 64K packs but you can use only 56K and that allows you to use 48K for Basic and 8K RAM where the ROM used to be, between 8K and 16K, for machine code.

There are some restrictions on using the 48K as you cannot run machine code in it and you have to be careful that the display file does not cross the 32K border. Memotech now has 16K and 32K RAM packs in the same boxes as its 64K ones, which are often used by dealers as a second choice to the Sinclair 16K RAM. Memotech has a good reputation for service. The 32K pack allows you to use your 16K RAM pack as well to achieve 48K.

The boxes are made from extruded aluminium and are used as a heatsink for the internal +5V regulator. RAM wobble problems should be familiar to all readers and Memotech is no exception but the company provides a Velcro strip which binds the packs to the ZX-81 and other packs. The instructions are clear and concise in a booklet accompanying each pack but they are expensive.

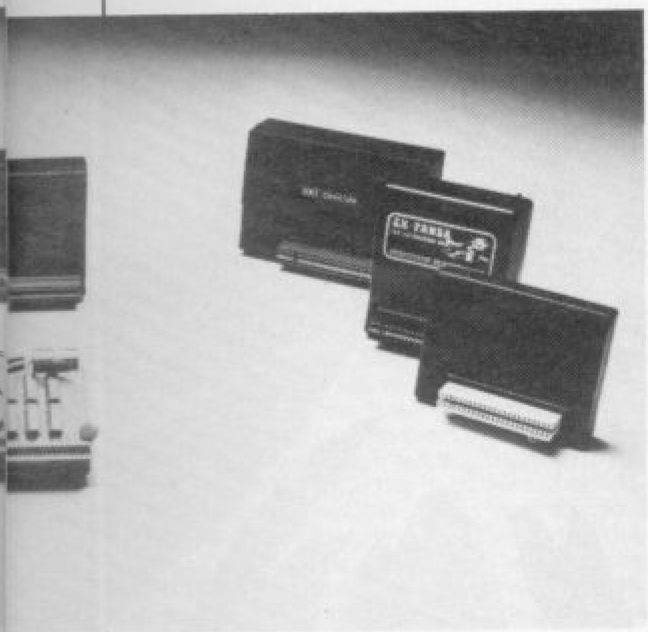
The Sinclair 16K RAM pack has received both complaints and praise. The complaints are from users who have had to experience RAM pack wobble, which occurs when using the Sinclair keyboard. The design of the RAM pack is such that it is not connected firmly to the ZX-81 and the top of the RAM pack rests against the top of the ZX-81 case. Every time the keyboard is used that lifts the RAM pack from the table and shakes it. The edge connector eventually becomes so loose that any slight movement will disconnect it from the ZX-81, corrupting the ZX-81 memory.

Several methods have been produced to stop the wobble — flexible cables so that the RAM pack can be laid flat on the table from dK'tronics and the RAM-LOK from Adapt Electronics which bolts together the ZX-81 and RAM.

The best method, though, is to buy a RAM pack which has been designed to eliminate the wobble. They consist mostly of not allowing the circuit board to be connected to the casing of the RAM pack, so that the board can move up and down inside the case with the movement of the ZX-81. A reliable stiff edge connector is also required. Some, like that from Cheetah, have also been designed to wrap round the back of the ZX-81 so that there is little movement between the two casings. Some manufacturers are also using +5V-only RAMs so that they do not have to provide a power supply from the +9V supply which can vary depending on the equipment used.

Kayde, Camel and Econotech 16K RAMs are good examples of the first type, the first two being cased. The ZX-Panda and the Cheetah are good examples of the second type.

The ZX-Panda can also be used to give 32K by adding a small PCB containing 16K more RAM inside the case. The special Audio Computers RAM pack is in the category where the design has not been so successful. The RAM



pack was specially-shaped to conform with the back of the ZX-81 but it still requires sticky pads and a special plastic insert to prompt it to work. Some of the RAM packs provide a LED — a little red light — but that only provides an indication that there is power to the RAM pack and not whether it is working correctly.

The best choice is obviously a non-wobble RAM pack which is inexpensive. If you can afford it and do not want to use pre-programmed ROMs or other devices, opt for a cheap 64K RAM pack. They take up just as much power as the 16K and will also work with the Sinclair printer — see the table for a list of facilities of the various RAM packs.

Basicare provides a different kind of RAM; you must first buy a base module to use its RAM, called a Persona. It is in 16K and 64K packs for the ZX-81 up to a maximum of 512K. That is divided into banks and you will require other modules to have the banks talk to each other. The maximum memory available at one time is 32K. It is the only system which allows you to run big programs but at the moment there is very little software to run it.

Yet another type of RAM pack is available and that is the battery-backed RAM — DROM, which allows the user to do things which normally would have to be run in from tape — instantly. They can provide storage for routines to side-scroll the screen in any direction, assemblers, new operating systems to replace the Sinclair ROM or even your own favourite Basic program.

A multitude of DROM packs is produced by Camel Products. Two of them work on the ZX-81, the Memic 81 and the Cramic. The Memic 81 contains one or two static 2K by one-byte chips giving 2K or 4K of RAM backed-up by a battery when the power is off to preserve its memory. That occupies any position in 8K-16K area of the memory map. DROM devices allow you to write a machine code or a Basic program and transfer it into the 8K-16K area of the memory map. Machine code can be run from there, saving valuable RAM space, but Basic programs must be uploaded to the Basic area before running the program.

That means that any Basic program is limited to 8K unless the Cramic is used which is 16K long. The routines for the transfers are included in the notes with every pack and consist of machine code routines which must be run by using the USR command.

The Cramic is a special case as the 16K can be switched in or out by a software switch and so a Basic program can be loaded from tape into the Cramic and sealed-off from the ZX-81. Powering-off the ZX-81 then has no effect, as the RAM module has its own battery to keep it operating. The program can be restored by powering-up the ZX-81 and running a machine code program to step back in the Cramic where you ceased. That leads to my first criticism of the notes; nowhere is it mentioned that you should save the machine code program on tape, in case something goes wrong.

The code required is very short but as it needs to be put into memory before using Cramic it would have been better to load it from tape. That routine could be stored in the Memic 81, of course, which is outside the Basic area and the routine loaded into the Basic area from there. The advantage of DROM over ROM is that it can be changed.

The other DROM is available only in kit from from Hunter Electronics and consists of board which plugs into the back of the ZX-81 and provides 2K of battery-backed RAM, with space for three more chips. If you wish, some of them can be turned into ROM sockets to take 2K or 4K EPROMs.

The RAM pack race has now become so cut-throat that a few firms which were doubtful have withdrawn. The firms remaining are giving the customers what they want, depending on price. Cheap is not necessarily nasty any more. So look for the bargains — they are there to be found.

DROMS

Memic 81 4K	**£34.45**
Cramic 16K	**£91.95**
Basicare 2K	**£39.50**
Hunter 2K	**£19.95**

SUPPLIERS

Basicare Microsystems Ltd, 12 Rickett Street, London SW6.
Cambridge Microelectronics (Camel), 1 Milton Road, Cambridge.
Cheetah Marketing Ltd, 359 The Strand, London WC2.
JRS (Econotech), 19 Wayside Avenue, Worthing, Sussex.
dk'tronics, Unit 2, Shire Hill Ind. Estate, Saffron Walden, Essex.
Kayde, The Conge, Great Yarmouth, Norfolk.

RAM pack	Anti-wobble	+5V only	Cased	Price
Basicare 16K	✓		✓	£26.75
Basicare 64K	✓		✓	£76.25
Camel 16K	✓	✓	✓	£20.64
Camel 64K	✓		✓	£80.45
Cheetah 16K	✓		✓	£19.75
Cheetah 64K	✓		✓	£44.75
Econotech 16K	✓			£20.95
dK'tronics 16K	✓		✓	£22.95
dK'tronics 64K	✓		✓	£52.95
Kayde 16K	✓	✓	✓	£29.95
Memotech 16K			✓	£29.90
Memotech 32K			✓	£49.95
Memotech 64K		✓	✓	£79.00
Sinclair 16K			✓	£29.95
ZX-Panda	✓	✓	✓	£19.95

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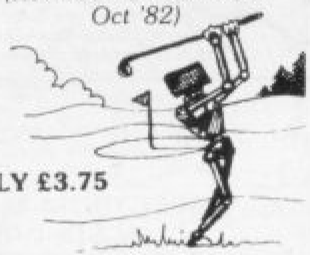
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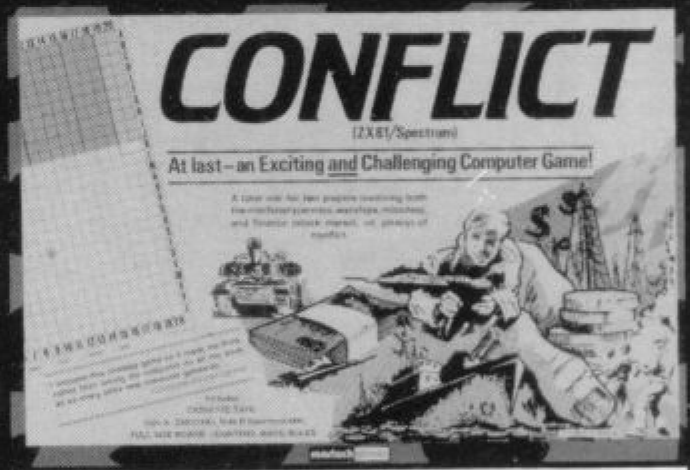
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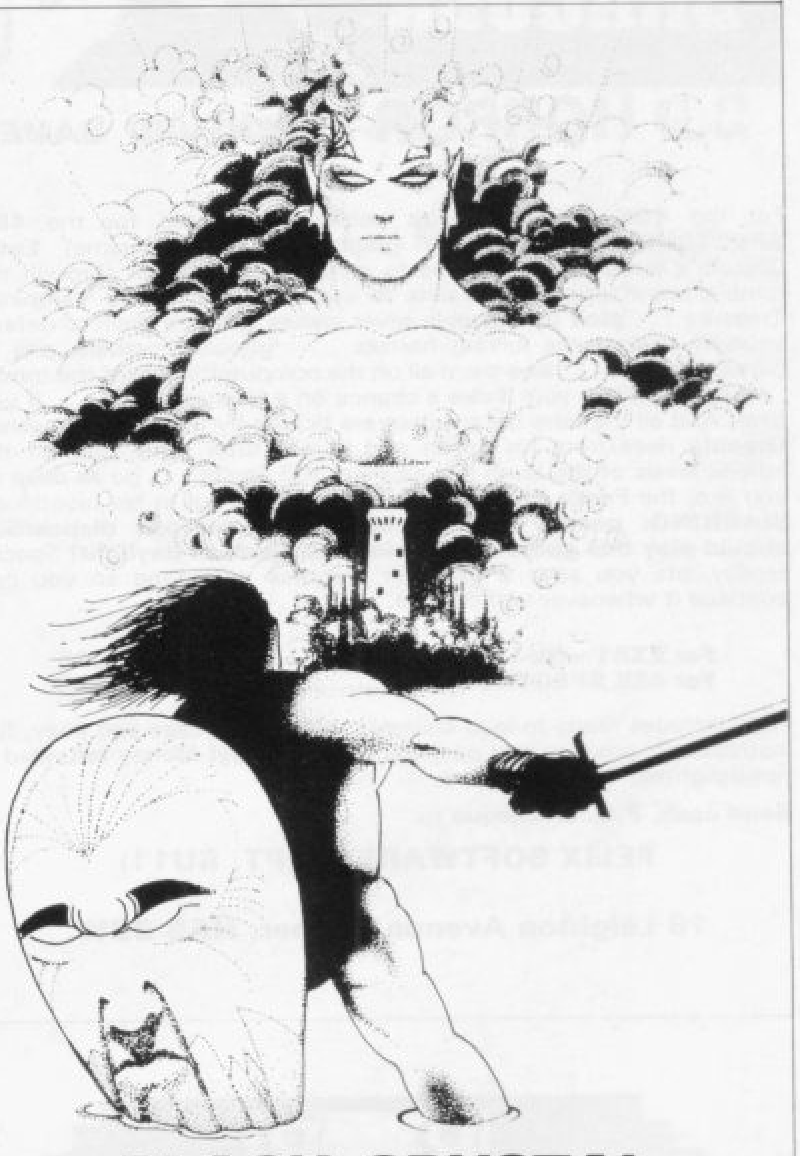
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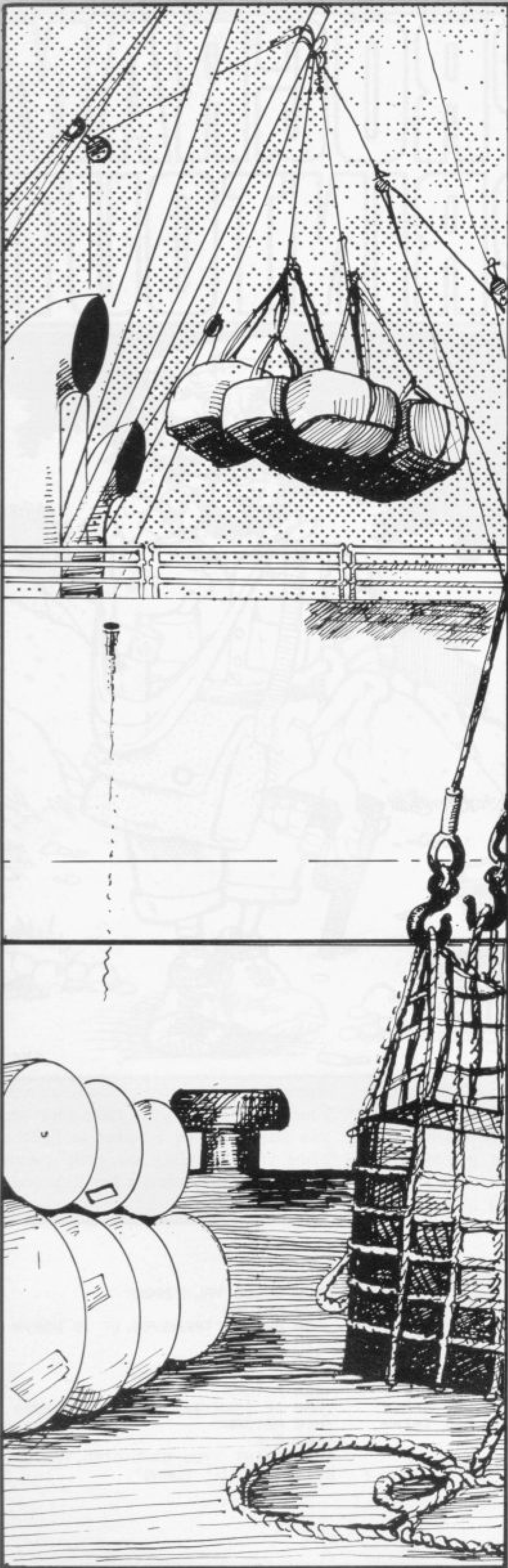


1K ADVENTURE

DAVID CLARK of Earlsferry, Fife has written a mini-adventure for the 1K ZX-81. You start with 500 strength points and 0 treasure points.

Finding a potion will increase your strength; finding treasure will increase your wealth. When you meet a monster you must decided whether to fight or bribe it, depending on your points. After each turn, press a key to proceed in the adventure.

```
   5 SAVE "1K ADVENTURe"
  10 LET S=VAL "500"
  20 LET T=PI-PI
  30 LET TU=PI/PI
  40 PRINT "TURN ";TU;" TREASURE
";T;" STRENGTH ";S
  43 IF S<=0 THEN GOTO 5000
  45 PRINT "YOU HAVE FOUND:-"
  50 LET X=INT (RND*VAL "75")
  60 LET H=INT (RND*INT PI)+PI/P
I
  65 GOSUB H*100
  70 LET S=S-10
  80 CLS
  90 LET TU=TU+1
  95 GOTO VAL "40"
 100 PRINT "A MONSTER.F/B?"
 110 INPUT I$
 120 IF I$<>"F" AND I$<>"B" OR I
$="B" AND T<X THEN GOTO 110
 130 IF I$="F" THEN LET S=S-X
 140 IF I$="B" THEN LET T=T-X
 150 GOSUB 2000
 190 RETURN
 200 PRINT "A POTION"
 210 LET S=S+X
 220 GOSUB VAL "2000"
 230 RETURN
 300 PRINT "TREASURE.IT IS WORTH
";X
 310 LET T=T+X
 350 GOSUB VAL "2000"
 400 RETURN
2000 IF INKEY$="" THEN GOTO 2000
2010 RETURN
5000 CLS
5010 PRINT "YOU HAVE DIED.YOU S$
RVIVED:";TU;" TURNS"
```

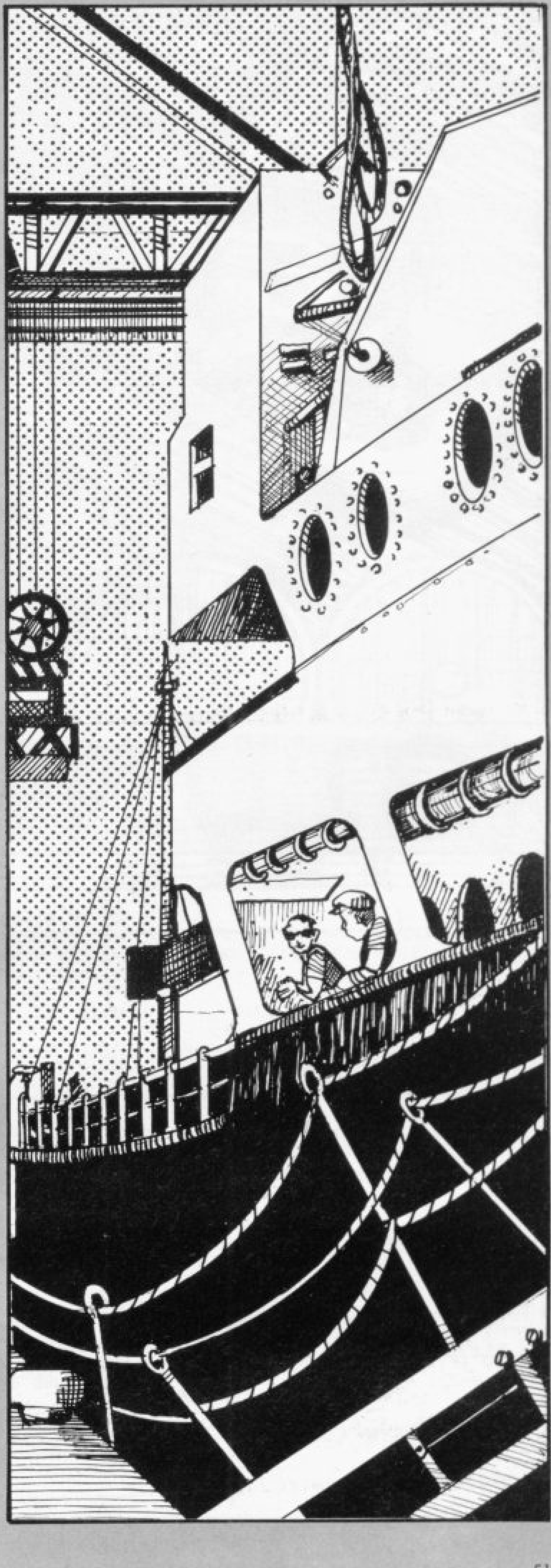


```
   2 LET Y=0: LET HIGH=6: LET Y$
="ZX SPECTRUM"
   3 PAPER 5: BORDER 4: CLS
   5 INPUT AT 21,0;"TELL ME YOUR
 NAME ?";Z$: IF Z$=Y$ THEN PRINT
 "OH NO,NOT YOU AGAIN!!"
   6 PRINT "HELLO ";Z$'" TIME TO
 PLAY FERRY"
   7 FOR Q=1 TO 220: NEXT Q
   8 PRINT '"USE<5>TO MOVE LEFT"
'"USE<8>TO MOVE RIGHT"''"PRESS A
NY KEY TO START.": FOR Q=1 TO 22
0: NEXT Q: PRINT ''TAB 10;"GOOD
LUCK": PAUSE 0
  10 LET T=2
  15 LET LM=-1: LET QZ=166
  20 LET X=0
  30 LET T=T+1
  33 LET LM=LM+1: LET QZ=QZ-8
  35 RESTORE
  40 LET G=25
  50 LET B=4

  60 LET C=B
  70 LET D=C
  80 LET F$="█"
  90 LET E=120
 100 LET B$="aaaa"
 110 LET C$=B$
 120 LET D$=B$
 121 GO SUB 125
 122 GO TO 165
 125 CLS
 130 IF B=0 AND C=0 AND D=0 AND
T>0 AND Y>=QZ THEN FOR W=1 TO 8:
 READ D,P: BEEP D,P: NEXT W: GO
TO 30
 131 IF X=0 THEN GO TO 135
 132 PRINT TAB 17;: FOR Q=1 TO X
: PRINT "a";: NEXT Q
 135 PRINT AT 0,0;"SHIPS ";T;AT
LM,14;"██"
 140 PRINT AT LM+1,15;F$;AT 20,3
;F$;AT 20,13;F$;AT 20,23;F$
 150 PRINT AT 21,3;B$(1 TO B);AT
 21,13;C$(1 TO C);AT 21,23;D$(1
TO D)
 160 RETURN
 165 LET E=10+INT (RND*200)
 170 FOR Y=QZ TO 16 STEP -1
 180 LET E=E-(INKEY$="5" AND E>1
)+(INKEY$="8" AND E<254)
 200 PLOT E,Y
 210 NEXT Y
 230 IF E>23 AND E<28 THEN LET B
=B-1: IF B>=0 THEN GO TO 263
 240 IF E>104 AND E<109 THEN LET
 C=C-1: IF C>=0 THEN GO TO 263
 250 IF E>183 AND E<188 THEN LET
 D=D-1: IF D>=0 THEN GO TO 263
 262 GO TO 330
 263 BEEP .2,15: LET G=E
```

FERRY

```
 264 GO SUB 125
 265 FOR Y=16 TO QZ STEP 1
 270 LET G=G-(INKEY$="5" AND G>1
)+(INKEY$="8" AND G<254)
 290 PLOT G,Y
 295 NEXT Y
 300 IF G<=125 AND G>=119 THEN G
O TO 315
 310 GO TO 330
 315 LET X=X+1
 317 BEEP .2,15
 320 GO TO 120
 325 IF B=-1 THEN LET B=0
 326 IF C=-1 THEN LET C=0
 327 IF D=-1 THEN LET D=0
 330 PRINT AT 10,16;"CRASH"
 331 BEEP .5,-30
 338 IF D<0 THEN LET D=0
 339 IF C<0 THEN LET C=0
 340 IF B<0 THEN LET B=0
 341 LET T=T-1
 343 FOR P=1 TO 50
 344 NEXT P
 346 IF T=0 THEN CLS : PRINT "GA
ME ENDED."''"YOUR SCORE ";Z$;" I
S ";X
 351 IF X>HIGH AND X>0 THEN LET
HIGH=X: LET Y$=Z$
 353 IF T=0 THEN PRINT '"THIS SE
SSIONS HIGHEST SCORE SO  FAR IS
";HIGH;" BY ";Y$: GO TO 1000
 360 GO TO 120
1000 PRINT '"AGAIN?(Y/N)"
1015 POKE 23658,8
1020 LET O$=INKEY$
1030 IF O$="N" THEN STOP
1040 IF O$<>"Y" THEN GO TO 1020
1050 GO TO 2
1100 DATA .1,11,.1,11,.4,14,.05,
13,.05,18,0.5,11,.05,16,1,22
2000 SAVE "FERRY" LINE 2100
2100 FOR i=0 TO 7: POKE USR "a"+
i,66: IF i=2 OR i=6 THEN POKE US
R "a"+i,255: NEXT i
```



MANOEUVRE your ferry from port to collect the crates at the three ports on the other side of the river. Once you have collected a crate you must return to base with it before collecting the next crate.

The game was written for the 16K Spectrum by Peter Stiles of Harrow, Middlesex. Letters to be entered in graphics mode are underlined.

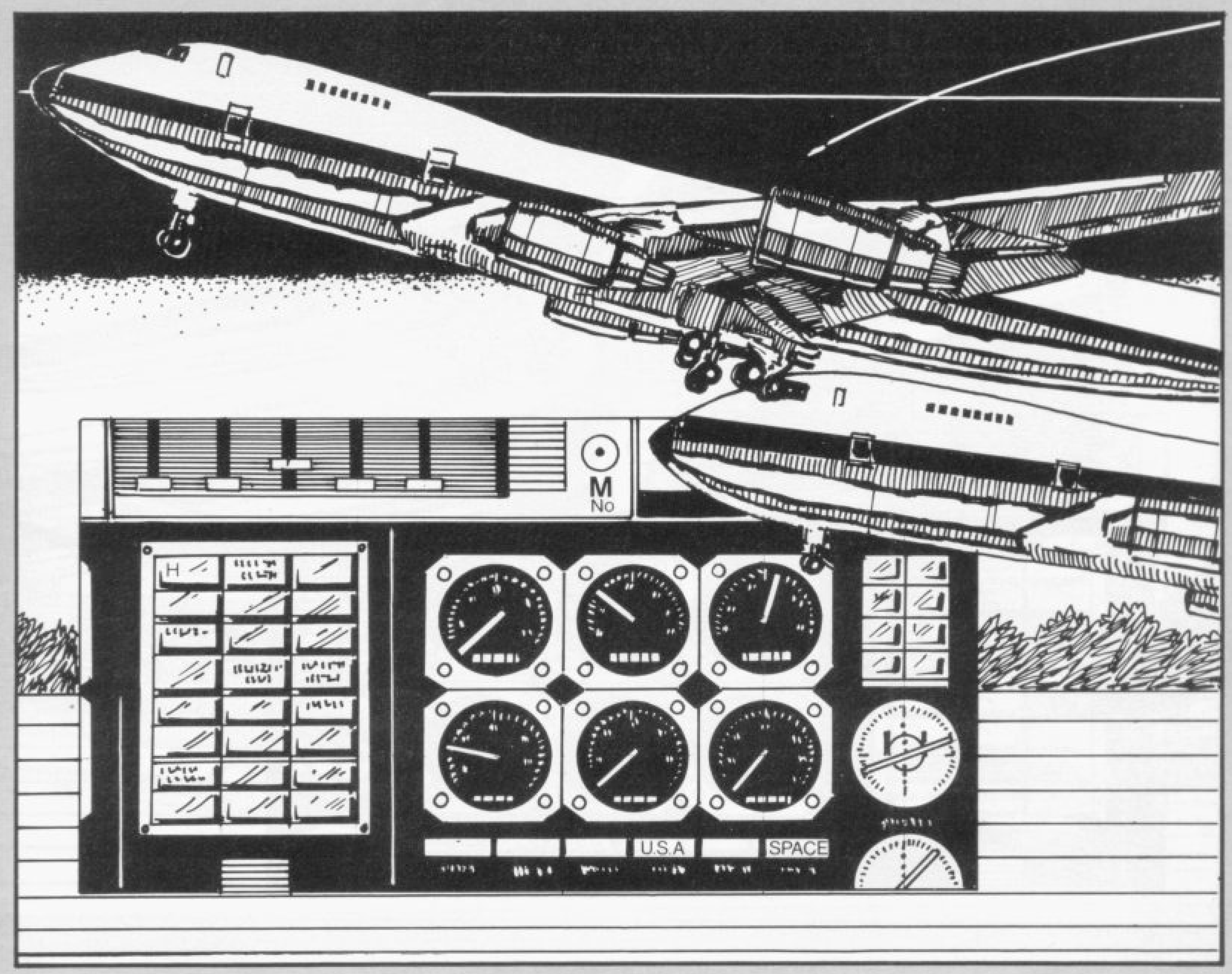


USE THE KEYS J and L to jump your **Stunt Rider** over the barrels without crashing. Each time you succeed the number of barrels for you to jump increases.

Stunt Rider was written for the 16K ZX-81 by Graeme Patterson of Huddersfield, West Yorkshire.

STUNT RIDER

```
  1 REM "STUNT"
  2 LET H=0
  3 LET S=0
  4 LET F=10
  6 GOSUB 500
  7 PRINT "**STUNT RIDER**"
 10 LET A=CODE " "
 20 LET B=CODE "="
 21 LET D=INT (RND*30)
 24 IF D<F+5 THEN LET D=F+5
 25 IF F>=23 THEN PRINT AT 20,F-12;"          "
 29 PRINT AT 20,F+1;"          "
 30 PRINT AT CODE "+",CODE " ";"          "
 31 PRINT AT 20,D;"(9t)"
 40 PRINT AT B-1,A;"(96:))";AT B,A;"(O:97:O)"
 45 PRINT AT B-1,A;"     ";AT B,A;"     "
 50 PRINT AT 19,9;" /";AT 20,8;" /"
 60 IF INKEY$="J" AND A>4 THEN LET B=B-1
 61 IF INKEY$<>"J" AND A>4 THEN LET B=B+1
 62 IF INKEY$="L" THEN LET B=B+1
 63 IF B>=20 THEN LET B=20
 64 IF F>=23 THEN LET F=10
 70 LET A=A+1
 71 PRINT AT 20,F;"0"
 72 IF A=D OR A+1=D OR A+2=D AND B=20 THEN PRINT AT 20,D;"CRASH"
 73 IF A=D OR A+1=D OR A+2=D AND B=20 THEN GOTO 120
 74 IF A>5 AND A<=F AND B=20 THEN PRINT AT B,A;"CRASH"
 75 IF A>5 AND A<=F AND B=20 THEN GOTO 120
 76 IF A>5 AND A>F AND B=20 THEN PRINT AT 20,F+4;"          "
 77 IF A>5 AND A>F AND B=20 THEN GOTO 103
 79 GOTO 21
103 LET S=S+1
104 PRINT AT 1,5;"JUMPS=";S;AT 2,5;"HI=";H
105 LET F=F+1
107 GOTO 10
120 PRINT AT 10,10;"GAME OVER"
121 PAUSE 80
122 CLS
130 IF H>=S THEN GOTO 3
131 LET H=S
135 PRINT "YOU HAVE JUMPED MOST BARRELS,INPUT NAME."
140 INPUT N$
145 CLS
150 PRINT AT 1,0;"MOST JUMPS=";H;AT 3,0;"**********BY:";N$
160 PAUSE 150
165 CLS
170 GOTO 3
500 PRINT AT 0,5;"**************";AT 1,5;"*STUNT RIDER*";AT 2,5;"**************"
501 PRINT AT 4,0;"JUMP: KEY""J""";AT 6,0;"DESCEND: DEPRESS KEY ""J""";AT 8,0;"STEEP DESCENT: KEY ""L"""
502 PRINT AT 10,0;"TRY TO JUMP THE BARRELS AND      LAND YOUR VEHICLE BEFORE THE ""▚"""
503 PRINT AT 13,0;"IF YOU JUMP SUCCESSFULLY THEN   YOU WILL LENGTHEN THE NUMBER OF  BARRELS."
504 PRINT AT 17,0;"IF YOU MANAGE TO JUMP 13 BARRELS THEN THE NO. OF BARRELS GOES   BACK TO 1."
505 PRINT AT 20,0;"IF YOU PASS THE ""▚""THEN THE     GAME ENDS."
510 PAUSE 400
511 CLS
512 RETURN
```



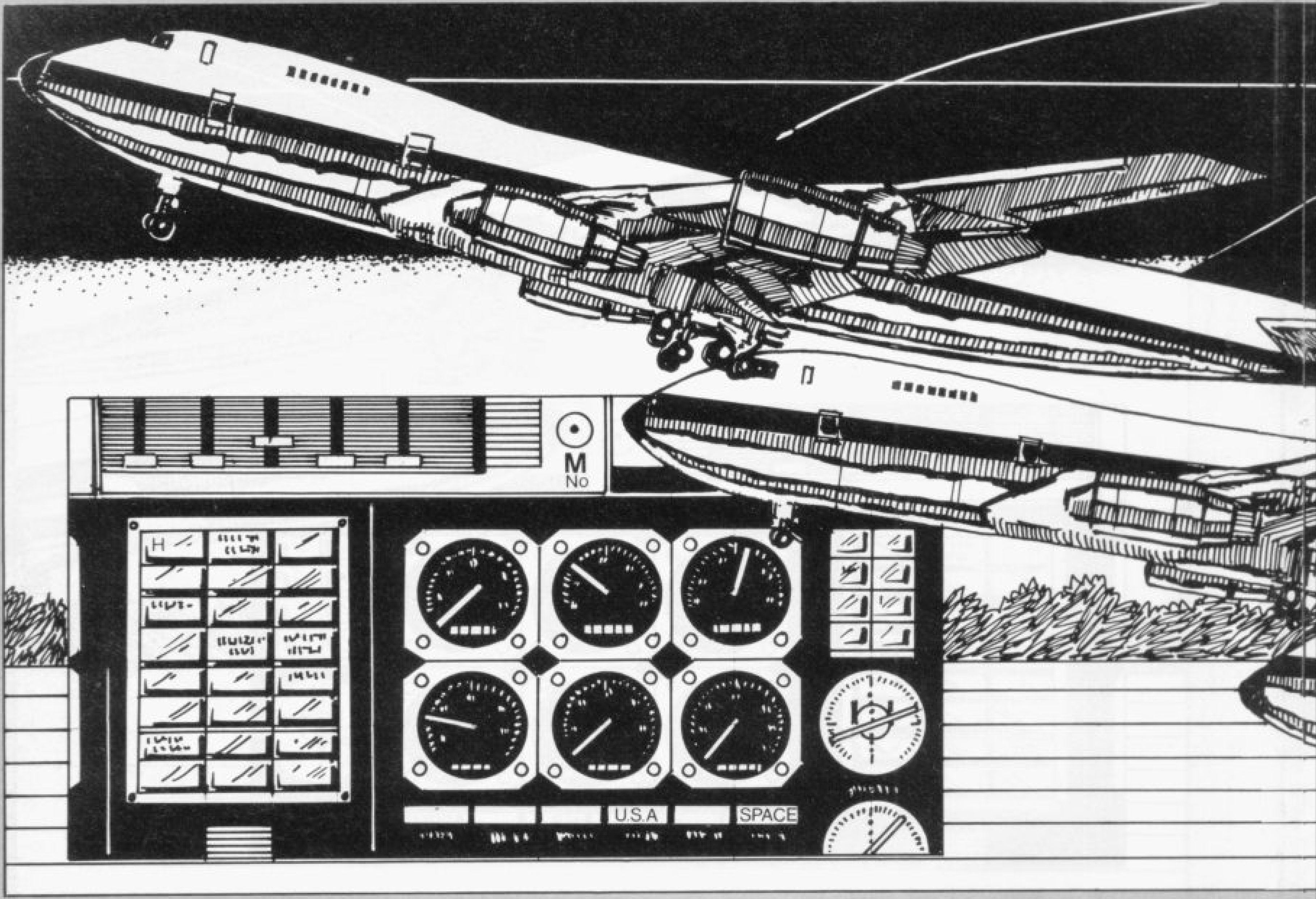
AIRPLANE

AIRPLANE simulates an aeroplane flight from London to one of 10 airports round the world. The screen displays your control panel, complete with information about speed and course.

You are given the opportunity to change your speed, height and course. If you choose not to alter any of them, enter "0". Keep your changes within the defined limits and look carefully at the readings displayed before making a change. You have no second chances and a slight mistake will lead to a crash.

The program was written for the 16K Spectrum by David Courtier-Dutton of Bradfield, Berkshire.

```
   1 LET zx=0: LET x=0: LET y=0: LET z=0
  10 GO SUB 1020
  11 GO SUB 9500
  15 LET m=l: LET tr=w: BORDER 6: PAPER 7: INK 2
  20 PLOT 89,145: DRAW INK 3;7,0: PLOT (89+INT l/50),145: DRAW INK 3;INT w/50,0
  30 PRINT AT 17,15;"DESTINATION"
 100 LET a=0: LET s=0: LET d=0: LET r=0: LET c=0: LET f=29: LET n=0
 200 OVER 1: INK 2: PLOT 0,0: DRAW 255,0: DRAW 0,175: DRAW -255,0: DRAW 0,-175
 210 PLOT 0,16: DRAW 255,0: PRINT AT 20,0; INK 1;"FUEL"
 220 PLOT 32,0: DRAW 0,16: PLOT 32,8: DRAW 223,0
 230 PRINT AT 20,4; INK 3;"0  50  100  150  200  250 300"
 240 PLOT 88,16: DRAW 0,159: PLOT 0,144: DRAW 255,0
 250 PRINT AT 14,1; INK 1;"ALTITUDE"
 251 PRINT AT 10,3; INK 1;"RANGE"
 252 PRINT AT 2,2; INK 1;"SPEED"
 253 PRINT AT 6,1; INK 1;"TAIL FLAP"
 254 PRINT AT 0,0; INK 3;"INSTRUMENTS"
 255 PRINT AT 12,0; INK 1;"RUNWAY LEFT"
 256 PRINT AT 18,0; INK 1;"FLAP ANGLE"
 257 PRINT AT 8,1; INK 1;"R/BEARING"
 258 PRINT AT 4,0; INK 1;"ACCELERATE"
 259 PRINT AT 16,1; INK 1;"DROP RATE"
 310 PLOT 89,95: DRAW 166,0: PLOT 0,160: DRAW 88,0: PLOT 89,112: DRAW 166,0
 340 FOR t=32 TO 128 STEP 16: PLOT 0,t: DRAW 86,0: NEXT t
 390 PRINT AT 21,4;"
                                ": OVER 0: GO SUB 700
 520 IF s<150 AND a>0 THEN GO TO 5000
 540 PRINT AT 5,13;"Increase/Decrease";AT 6,13;"thrust +75/-75?"
 560 INPUT x: IF x>75 THEN LET x=75
 565 IF x<-75 THEN LET x=-75
 570 LET s=s+x: LET c=x: LET x=0: IF s>600 THEN LET s=600
 572 LET s=s-5: IF s<0 THEN LET s=0
 573 LET l=l-INT (1.25*(s*(1-d/100)))
```




```
 575 GO SUB 700
 578 IF s<150 AND a>0 THEN GO TO
 5000
 580 LET x=0: PRINT AT 5;13;"Cha
nge flap angle?";AT 6,13;"50/-50
          ": INPUT y: LET n=n+y:
 IF n>50 THEN LET n=50
 581 IF n<-50 THEN LET n=-50
 582 LET a=a+INT (3.06*n): IF a<
-5 THEN GO TO 5020
 583 IF a>=500 THEN LET a=500
 585 IF a<4 AND l>100 THEN LET a
=0
 590 LET r=INT (3.06*n): LET s=s
-n
 595 IF a<0 AND a>=-5 THEN LET a
=0
 600 GO SUB 700
 605 LET zx=1

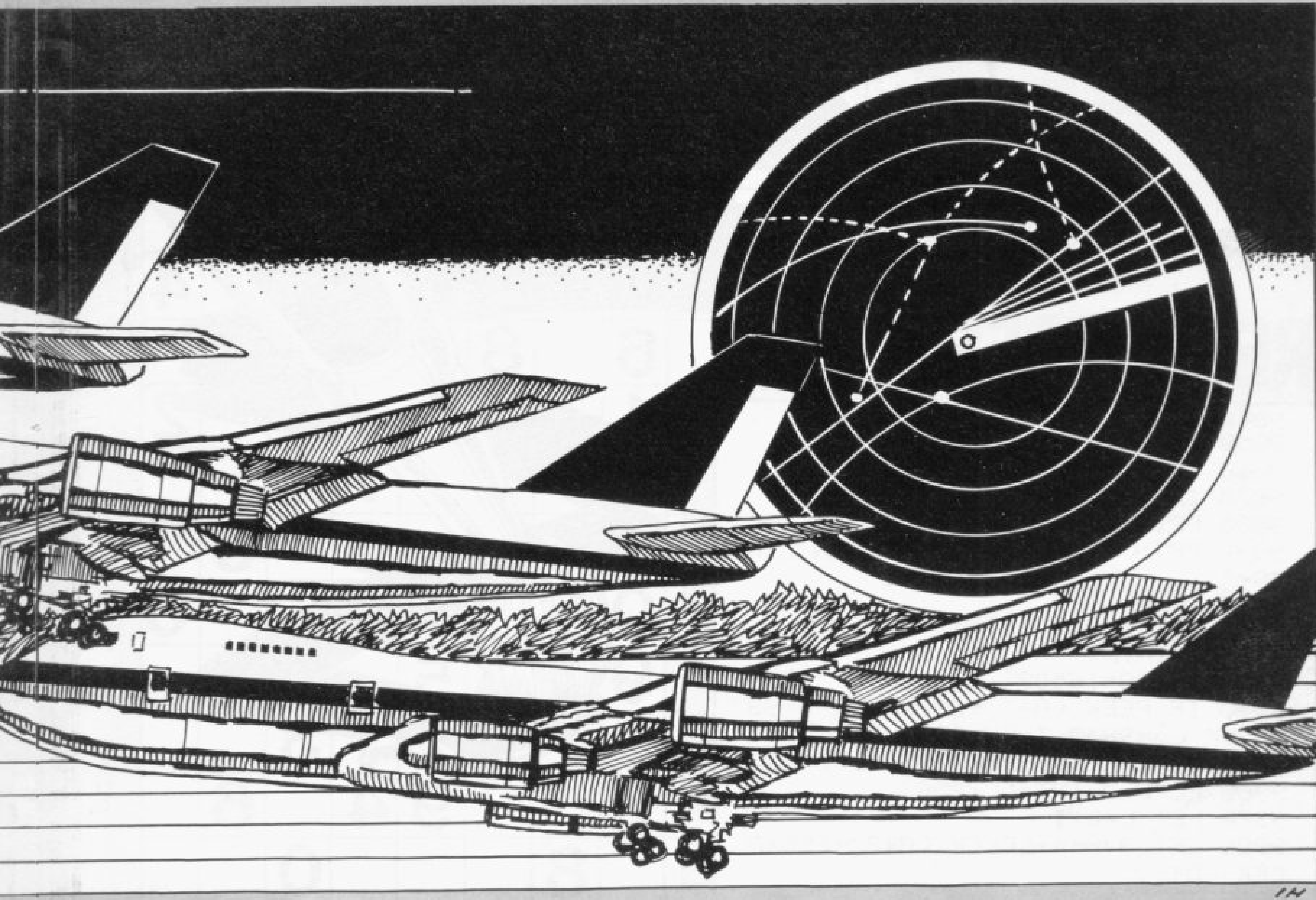
 610 PRINT AT 5,13;"Alter tail f
lap?  ";AT 6,13;"+45/-45": INPUT
 z: LET d=d+z: IF Pe>179 THEN LE
T Pe=-179
 612 IF Pe<-179 THEN LET Pe=179
 620 LET Pe=Pe-d
 630 IF l<=0 THEN LET w=w-s
 635 IF f<=0 THEN GO TO 5040
 640 IF a<0 AND l>0 THEN GO TO 5
080
 645 IF a<=0 AND Pe<>0 AND l<=25
0 THEN GO TO 5100
 660 LET f=f-INT ((n/10+s/20)/ (
e/2)): IF f<=0 THEN GO TO 5040
 670 IF l>400 AND l<500 AND a>5
AND a<50 THEN LET a=100
 675 IF s>230 AND a<=0 THEN LET
a=50
 680 IF w<=0 THEN GO TO 5060

 700 PRINT AT 3,1; INK 0;s;"  ";
AT 15,1;a;"  ";AT 11,1;l;"  ";AT
 7,1;d;"  ";AT 19,1;n;"  ";AT 5,
1;c;"  ";AT 17,1;r;"  ";AT 9,1;P
e;"  ";AT 13,1;w;"  "
 810 FOR t=16 TO 144 STEP 16: PL
OT 0,t: DRAW 86,0: NEXT t
 860 PRINT AT 8,12; INK 4;"  -
R/BEARING  +"
 880 PRINT AT 9,12;"
       "
 890 PRINT AT 9,21;"o": PRINT AT
 9,21-INT (Pe/20);"^"
 892 IF zx<>0 THEN GO TO 900
 895 RETURN
 900 PLOT INK 0;INT ((m-l)/50)+8
9,INT a/18+146
 905 LET zx=0
 910 PRINT AT 21,f;"   "
 920 IF a<=0 AND w>=0 AND f>0 AN
D Pe=0 AND l<0 AND s<=0 AND S>=-
1 THEN GO TO 6000

 935 IF a<=40 THEN PRINT AT 16,1
5; INK 2; PAPER 7; FLASH 1;"ALTI
TUDE"
 940 IF s<165 THEN PRINT AT 14,1
5; INK 2; PAPER 7; FLASH 1;"SPEE
D"
 945 IF l<100 THEN PRINT AT 12,1
5; INK 2; PAPER 7; FLASH 1;"RANG
E"
 950 IF l<300 AND Pe<>0 THEN PRI
NT AT 13,15; INK 2; PAPER 7; FLA
SH 1;"R/BEARING"
 955 IF w<200 THEN PRINT AT 12,1
5; INK 2; PAPER 7; FLASH 1;"RUNW
AY LEFT"
 960 FOR q=1 TO 100: BEEP .007,-
22: NEXT q: FLASH 0: PRINT AT 12
,15;"            ";AT 13,15;"
          ";AT 14,15;"
     ";AT 15,15;"            ";
AT 16,15;"            "
1000 GO TO 500
1020 PAPER 0: INK 5: BORDER 2: C
LS
1030 PRINT AT 10,10;"INSTRUCTION
S? [y/n]"
1035 IF INKEY$="n" THEN RETURN
1036 IF INKEY$="" THEN GO TO 103
5
1037 CLS
1040 BEEP .3,0: BEEP .3,0: BEEP
.3,0: BEEP .8,-5
1050 BEEP .3,3: BEEP .3,3: BEEP
.3,3: BEEP .8,-2
1060 FOR m=-7 TO 5: BEEP .1,m: N
EXT m: PAUSE 20: BEEP .17,15: PA
USE 15: BEEP .4,-25

1070 PRINT AT 10,12; INK 2;"AIRP
LANE": PAUSE 150: CLS
1080 PRINT " AIRPLANE simulates
an airoPlaneflight from London a
irport to   one of ten other air
Ports aroundthe world,the choice
 of which isyours.However flying
 a Plane is not as easy as you m
ay think,so read these instructi
ons         carefully"
1100 PRINT ''';"    "; FLASH 1;"
PRESS ANY KEY TO CONTINUE"
1120 IF INKEY$="" THEN GO TO 112
0
1130 CLS : PRINT ; FLASH 1;"BEAR
 IN MIND"; FLASH 0;'"You will st
all at under 150 KMH so do not t
ake off before this  sPeed is at
tained"

1140 PRINT '"To change altitude
a Positive    (uP) or negative (d
own) value    must be aPPlied to
the flaPs;    your altitude will
change by     three times the fla
P angle"
1150 PRINT '"To alter course use
 your TAIL    FLAP,when the runwa
y bearing    [R/BEARING] is 0 yo
u will be on"
1155 PRINT "course.In the R/BEAR
ING disPlay your destination is
rePresented by 'o' and your actu
al course by"
1158 PRINT "'^';when the 'o' dis
aPPears youwill be on course"
```



```
1160 PRINT ';"    "; FLASH 1;"PR
ESS ANY KEY TO CONTINUE"
1170 IF INKEY$="" THEN GO TO 117
0
1180 CLS : PRINT "Your speed wil
l decrease as you climb and incr
ease as you decendDue to air res
istance it will   decrease by 5
KMH after every   set of instruc
tions"
1190 PRINT '"The RUNWAY LEFT ref
ers to your  destination and if
this value isless than 0 you wil
l crash."
1200 PRINT '"Your position relat
ive to Londonand your destinatio
n is ploted  at the top of the s
ceen to show your position at a
glance.The    distance you are fr
om your       destination is show'
n in the      RANGE readout"

1220 PRINT ;''"    "; FLASH 1;"P
RESS ANY KEY TO CONTINUE"
1230 IF INKEY$="" THEN GO TO 123
0
1235 CLS : PRINT "To land succes
sfully your speed must equal 0,y
our altitude must equal 0,and yo
u MUST be on the  runway"
1240 PRINT '"Flashing instructio
ns will help you to fly the plan
e safely.                GOOD LUC
K!"
1250 PRINT ; INK 6;;''"TO REPEAT
 INSTRUCTIONS PRESS 'R'  PRESS A
NY OTHER KEY TO BEGIN"
1270 IF INKEY$="r" THEN CLS : GO
 TO 1080
1280 IF INKEY$="" THEN GO TO 127
0
4000 RETURN

5000 PAUSE 40: CLS : PRINT "You
stalled at ";s;" K/M/H and     c
rashed -USELESS": GO TO 5200
5020 PAUSE 40: CLS : PRINT "Your
 altitude is ";a;" meters so you
 have crashed -USELESS": GO TO 5
200
5040 PAUSE 40: CLS : PRINT "You
ran out of fuel  so you have cra
shed-USELESS": GO TO 5200
5060 PAUSE 40: CLS : PRINT "You
over shot the runway by ";ABS w;
" meters  so you have crashed -U
SELESS": GO TO 5200
5080 PAUSE 40: CLS : PRINT "You
tried to land ";l;" miles short
of the   runway   so you have cr
ashed-USELESS": GO TO 5200
5100 PAUSE 40: CLS : PRINT "You
have missed the runway completel
y by ";pe;" degrees and have cra
shed -USELESS": GO TO 5200
5200 PAUSE 300: CLS : PRINT "Ano
ther flight?(y/n)": IF INKEY$="y
" THEN GO TO 1: STOP
5300 GO TO 1
6000 LET k=INT f/3
6092 LET sc=INT (110*(w/tr)): LE
T k=(2*k)+sc
6100 PAUSE 100: CLS : PRINT "Wel
l done!You scored ";INT k;" poin
ts out of a possible 100": STOP
8100 STOP
9500 INK 7: BORDER 2: PAPER 0: C
LS : PRINT "WHICH AIRPORT?": PRI
NT "0)Istanbul"'"1)Chicago"'"2)M
ilan"'"3)Moscow"'"4)New York"'"5
)Port Stanley"'"6)Oslo"'"7)Tel A
viv"'"8)Delhi"'"9)Toronto"

9505 INK 2: PAPER 7
9510 IF INKEY$="1" THEN GO TO 96
00
9520 IF INKEY$="2" THEN GO TO 96
20
9530 IF INKEY$="3" THEN GO TO 96
40
9540 IF INKEY$="4" THEN GO TO 96
60
9550 IF INKEY$="5" THEN GO TO 96
80
9560 IF INKEY$="6" THEN GO TO 97
00
9565 IF INKEY$="0" THEN GO TO 97
20
9570 IF INKEY$="7" THEN GO TO 97
40
9575 IF INKEY$="8" THEN GO TO 97
60
9580 IF INKEY$="9" THEN GO TO 97
80
9585 GO TO 9510
9600 CLS : LET l=4235: LET e=15:
 LET w=700: LET pe=170: PRINT AT
 18,16;"CHICAGO": RETURN
9620 CLS : LET l=581: LET e=4: L
ET w=700: LET pe=35: PRINT AT 18
,16;"MILAN": RETURN

9640 CLS : LET l=1549: LET e=9:
LET w=640: LET pe=-10: PRINT AT
18,16;"MOSCOW": RETURN
9660 CLS : LET l=3500 : LET e=13
: LET w=750: LET pe=170: PRINT A
T 18,16;"NEW YORK": RETURN

9680 CLS : LET l=7406 : LET e=24
: LET w=440: LET pe=110: PRINT A
T 18,16;"PORT STANLEY": RETURN
9700 CLS : LET l=722 : LET e=5:
LET w=500: LET pe=-30: PRINT AT
18,16;"OSLO": RETURN

9720 CLS : LET l=1562 : LET e=9:
 LET w=480: LET pe=35: PRINT AT
18,16;"ISTANBUL": RETURN

9740 CLS : LET l=2230 : LET e=11
: LET w=650: LET pe=40: PRINT AT
 18,16;"TEL AVIV": RETURN

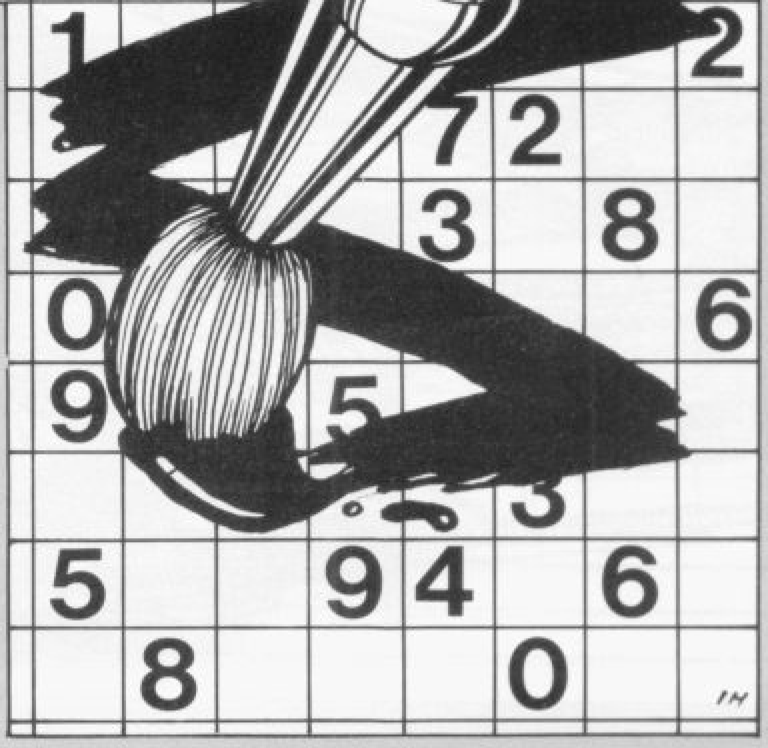
9760 CLS : LET l=5203 : LET e=18
: LET w=510: LET pe=34: PRINT AT
 18,16;"DELHI": RETURN
9780 CLS : LET l=3728 : LET e=14
: LET w=550: LET pe=-150: PRINT
AT 18,16;"TORONTO": RETURN
```

DAVID BARLOW of Liverpool has written this short **Renumber** routine for 16K ZX-81 users who want to make their programs look neater. The routine will change the line numbers of all the other lines in a program, beginning at the number you choose and increasing by a set amount. Remember that re-numbering will affect only line numbers. GOTOs and GOSUBs must be altered manually.



RENUMBER

```
9840 PRINT "FIRST LINE NUMBER=";
9850 INPUT L
9860 LET L=ABS INT L
9870 IF L>=9840 THEN STOP
9880 PRINT L
9890 PRINT "INTERVAL BETWEEN LIN
ES=";
9900 INPUT I
9910 LET I=ABS INT I
9920 PRINT I
9930 LET A=16509
9940 IF PEEK (A+1)+256*PEEK A=98
40 OR L>=9840 THEN STOP
9950 POKE A+1,L-256*INT (L/256)
9960 POKE A,INT (L/256)
9970 LET L=L+I
9980 LET A=A+4+(PEEK (A+2)+256*P
EEK (A+3))
9990 GOTO 9940
```



TASTY TOADS

YOU ARE the ravenous toad-eating crocodile at the bottom of the screen. Press 'P' to fire a venom blast which will gulp down one of those tasty toads passing overhead. The Society for the Protection of Toads, which objects to the wholesale slaughter, has erected a forcefield. Firing while a toad is behind it will result in all the frogs escaping, thus ending the game.

Tasty Toads was written for the 1K ZX-81 by Andrew Brewster of Rochester, Kent.



```
  1 REM "T"
  2 LET C=0
  3 LET A=0
  4 RAND
  5 FOR A=1 TO 5
  6 CLS
 10 LET M=18
 20 LET F=2*(INT (RND*8))
 30 FOR B=0 TO 20
 35 PRINT AT 6,0;"************FORC
E*FIELD**************"
 40 PRINT AT 19,15;"(i.'96'i.)"
;AT 18,14;"(9y'3**P'9t)";AT F,B;
"(i.'96'i.)";AT F+1,B;"(9t'i-'9y
)"
 50 IF M<F THEN LET M=18
 60 IF INKEY$="P" OR M<18 THEN
PRINT AT M,16;"."
 65 IF B=15 AND M=F THEN GOTO 1
50
 70 IF INKEY$="P" OR M<18 THEN
GOSUB 120
 80 PRINT AT F,B;" "
 90 NEXT B
100 NEXT A
120 PRINT AT M,16;" "
125 LET M=M-2
130 RETURN
150 PRINT AT M,B;" gulp ";AT M+
1,B;"      "
160 PAUSE 50
170 NEXT A
```



NOTEMAKER



PROGRAMS which arrive in the *Sinclair User* offices often contain tunes which, the accompanying letters tell us, were picked out at length on a musical instrument to the great distress of the programmer's family. **Notemaker** should put an end to that situation, by making it easy to write tunes for the Spectrum in the key of C.

A stave is displayed on the screen on which notes can be placed in the standard way. The tune thus composed can be played back and re-written until correct. By pressing "p" the notes used can then be listed as their beep values.

The program was written for the 16K Spectrum by Roger Frost of north London. Letters to be entered in graphics mode are underlined.

```
  20 GO TO 660
  30 REM b=main counter
  40 IF b>=57 THEN GO TO 490
  50 LET b=b+1
  60 LET m(b)=y(n): LET n(b)=11-n
  70 REM count/beep/print
  80 LET a=a+1
  90 IF a=30 THEN GO SUB 240
 100 INK ink: PRINT AT s+n(b),a;"b": BEEP .3,m(b): PRINT AT s+n(b)-1,a;("c" AND n(b)<>0): INK 0: RETURN
 110 REM memory gosub
 120 LET s=0: LET b1=b: LET a1=a: LET a=1: LET ink=1+ink: IF ink=3 THEN LET ink=0
 130 FOR b=2 TO b1
 140 GO SUB 70: PAUSE 15: NEXT b
 170 LET a=a1: LET b=b1: RETURN
 180 REM rub out gosub
 190 OVER 1

 200 GO SUB 100: OVER 0
 210 LET a=a-1: LET b=b-1: IF b=29 THEN LET a=b: IF b=29 THEN LET s=0
 220 IF b=1 THEN RUN 690
 230 RETURN
 240 REM print position
 250 LET s=11: LET a=2: IF b=30 AND k$<>"m" THEN GO SUB 400
 260 RETURN
 270 REM instructions
 280 OVER 1
 290 IF s=11 THEN RETURN
 300 PRINT AT 14,1;"PRESS c TO CONTINUE"
 310 PRINT AT 15,1;"PRESS 1-9 FOR NOTES"
 320 PRINT AT 16,1;"PRESS x TO RUB-OUT "
 330 PRINT AT 17,1;"PRESS m FOR MEMORY"

 340 PRINT AT 18,1;"PRESS r TO RE-RUN"
 350 PRINT AT 19,1;"PRESS s TO STOP      "
 360 PRINT AT 20,1;"PRESS p FOR A PRINTOUT": RETURN
 370 GO SUB 280: PAUSE 0: GO SUB 280  OVER 0: RETURN
 380 REM print staves
 390 CLS : LET s=0
 400 LET t=10
 410 FOR n=s TO s+9 STEP 2
 420 PLOT 9,171-n*8: DRAW 236,0
 430 PRINT INK 2;AT n,0;g$(t+1);AT n+1,0;g$(t);AT n,30;y(t+1);AT
```



```
 n+1,30;y(t)
 440 LET t=t-2: NEXT n
 450 PRINT INK 2;AT s+10,0;g$(1)
;AT s+10,30;y(1);
 460 PRINT AT 21,1;"PRESS i FOR
INSTRUCTIONS"

 470 PRINT AT s+10,1;" a a a a a
 a a a a a a a a a "
 480 RETURN
 490 PAUSE 0
 500 LET k$=INKEY$
 510 IF k$="i" THEN GO SUB 370
 520 IF k$="x" THEN GO SUB 180
 530 IF k$="m" THEN GO SUB 110
 540 IF k$="r" THEN RUN 690
 550 IF k$="s" THEN STOP
 560 IF k$="p" THEN GO TO 620
 570 LET k=CODE INKEY$
 580 FOR n=1 TO 11
 590 IF k=k(n) THEN GO SUB 30
 600 NEXT n
 610 GO TO 490
 620 CLS
 630 PRINT "NOTE   BEEP No."
 640 FOR n=1 TO b: PRINT n;"    "
;m(n+1): NEXT n
 650 STOP
 660 INK 0: PAPER 7: BORDER 0: C
LS
 670 PRINT : PRINT "           THE
 NOTEMAKER            ": PRINT : P
RINT
 680 PRINT INK 0;"THIS ENABLES Y
OU TO PLAY A TUNE USING THE TOP
NUMBER KEYS (AND q": PRINT : PRI
NT "YOU CAN PLAY IT BACK  USING
    ~MEMORY~(Key m)"
 690 DIM k(11): DIM y(11): DIM m
(60): DIM n(60)
 700 FOR x=1 TO 11: READ y(x): N
EXT x
 710 FOR n=1 TO 11: READ k(n): N
EXT n
 720 LET g$="1234567890q"
 730 FOR a=USR "a" TO USR "a"+23
: READ n: POKE a,n: NEXT a
 740 LET ink=0: LET x=2: LET a=1
: LET b=1
 750 PRINT : PRINT : PRINT : PRI
NT : PRINT INK 2;"    PRESS ANY
KEY TO START": PAUSE 0
 760 GO SUB 390: GO TO 490
 770 DATA 0,2,4,5,7,9,11,12,14,1
6,17
 780 DATA 49,50,51,52,53,54,55,5
6,57,48,113
 790 DATA 0,0,0,0,255,0,0,0,4,4,
52,124,255,252,248,112,0,0,4,4,4
,4,4,4
```

TAPE HEADER

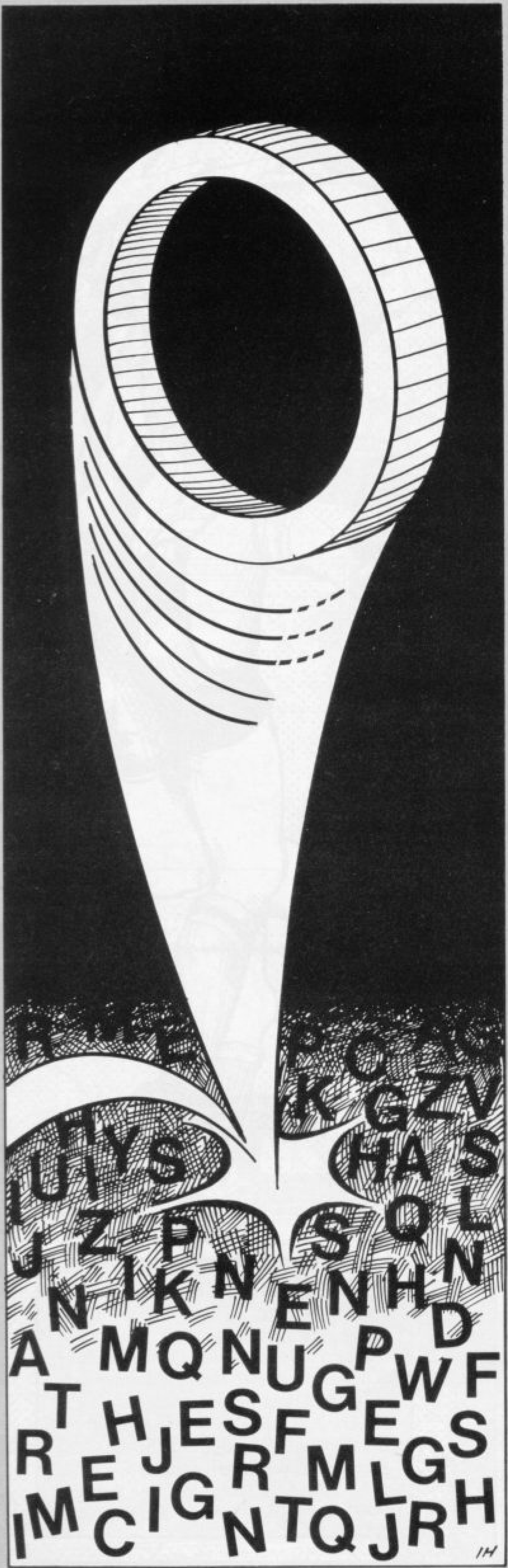
```
9979 REM
N.B. These addresses are for the
48k Spectrum and should be
changed for the 16k model.

9980 CLEAR 63999:
     FOR A=64000 TO 64013:
     READ B:
     POKE A,B:
     NEXT A:
     PRINT "Please load a tape a
nd Press"'"Play"'
9981 DATA 55,62,0,221,33,20,250,
17,17,0,205,86,5,201
9982 RANDOMIZE USR 64000
9983 LET A=64020:
     LET B=PEEK A:
     LET S=B
9984 IF B=0 THEN
     PRINT "Program          : ";
9985 IF B=1 THEN
     PRINT "Numeric array    : ";
9986 IF B=2 THEN
     PRINT "Character array  : ";
9987 IF B=3 THEN
     PRINT "Bytes            : ";
9988 FOR A=64021 TO 64030:
     LET B=PEEK A:
     PRINT CHR$ B;:
     NEXT A:
     PRINT
9989 LET B=PEEK A+256*PEEK (A+1)
:
     PRINT "Data length      : ";
B
9990 LET A=A+2:
     LET B=PEEK A+256*PEEK (A+1)
:
     IF S=3 THEN
     PRINT "Start address    : ";
B
9991 IF S<>0 THEN
     GO TO 9995
9992 IF B<1 OR B>9999 THEN
     GO TO 9994
9993 PRINT "Auto start at    : ";
B
9994 LET A=A+2:
     LET B=PEEK A+256*PEEK (A+1)
:
     PRINT "Prog/Vars length: ";
B
9995 PRINT :
     PAUSE 140:
     POKE 23692,255:
     GO TO 9982
```



J A SLATER of Bury, Lancashire has written a very useful utility program for the 48K Spectrum. **Tape Header** uses a small machine code subroutine to load the header data on a tape, then outputs that data to the screen.

Details of the length of the data, the program name, start address — bytes only — and the auto-start line number — Basic programs only — are all given.

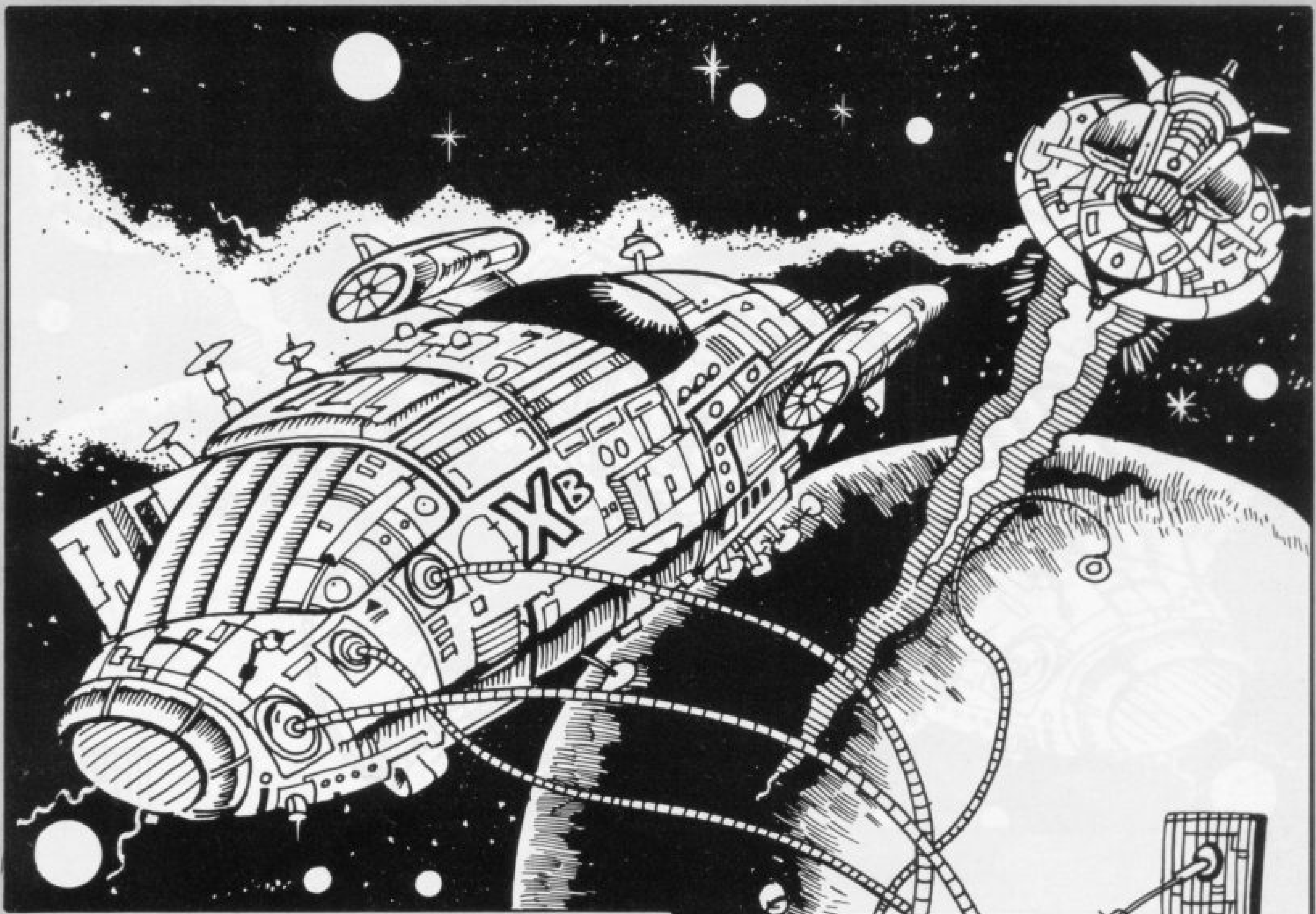


THE COMPUTER will print identical lines of inverse letters on the screen. It will then insert an inverse Ø in one of those lines. Almost immediately the lines will vanish and you will be asked on which line the Ø appeared.

This game requires all your concentration. Its writer, Peter Wilson, of Morpeth, Northumberland managed to score eight out of 10. That score seems to us to be almost impossible to beat (16K ZX-81).

ODD ONE

```
  1 REM odd one out
  2 LET S=0
  3 CLS
  4 LET T=12.5
  5 FOR Q=1 TO 10
 10 DIM A$(32)
 20 FOR N=1 TO 32
 30 PRINT AT 0,12;"ready";AT 0,
2;"     "
 40 LET A=INT (RND*26)+166
 50 LET A$(N)=CHR$ A
 60 NEXT N
 65 FOR P=1 TO 9
 67 PRINT AT P*2,0;P
 70 FOR O=1 TO 32
 80 PRINT AT P*2+1,O-1;A$(O);
 90 NEXT O
100 NEXT P
110 LET R=INT (RND*9)+1
120 LET RR=INT (RND*31)+1
130 PRINT AT R*2+1,RR;CHR$ 156
140 FOR N=1 TO T
150 NEXT N
160 CLS
170 PRINT "WHICH LINE HOLDS THE
odd one ?"
180 INPUT ANS
190 IF ANS=R THEN GOTO 250
200 PRINT "no-bad luck-IT WAS "
R
210 GOTO 255
250 PRINT "yes-";R;" IS correct
"
251 LET S=S+1
255 FOR N=1 TO 30
256 NEXT N
260 CLS
265 LET T=T-.8
270 NEXT Q
280 PRINT "YOU SCORED ";S;"/10"
290 PRINT AT 10,4;"ANOTHER GAME
? Y/N"
300 IF INKEY$="Y" THEN RUN
305 IF INKEY$="N" THEN STOP
310 GOTO 300
```

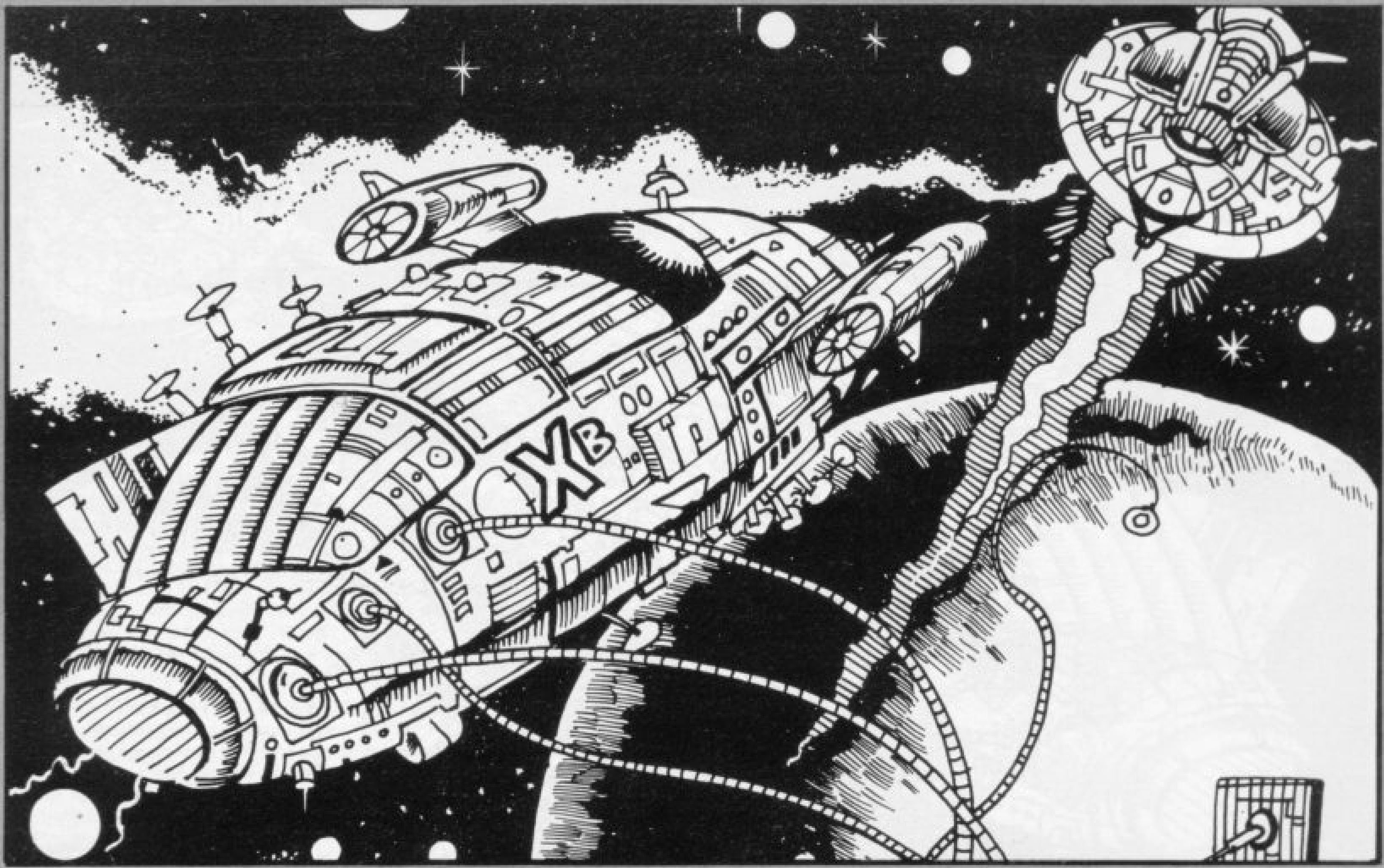


INTER STELLAR TRAFFIC

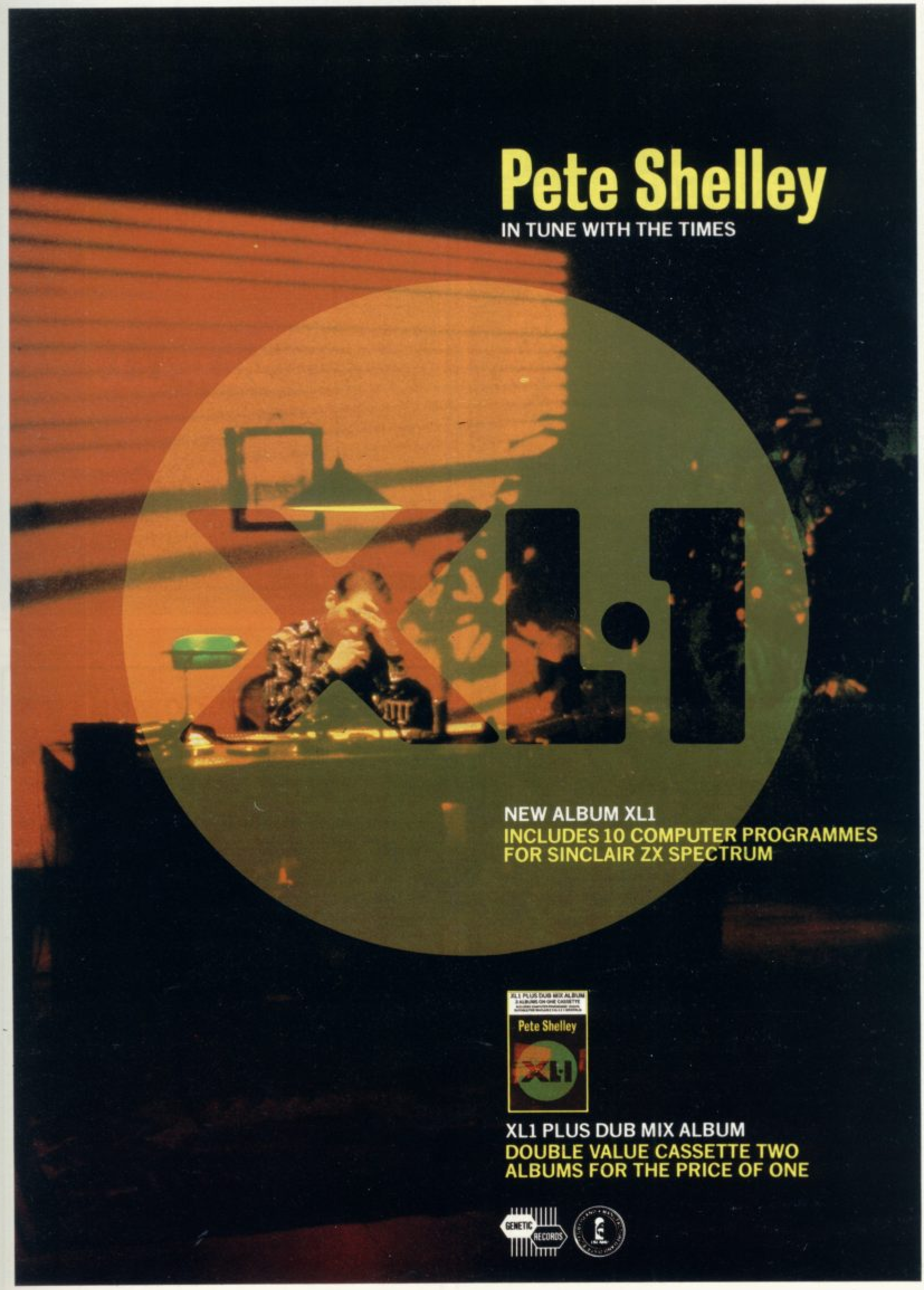
```
  1 LET P=INT (RND*30)
  2 LET Q=INT (RND*30)
  3 LET R=INT (RND*30)
  5 LET A=INT (RND*20)
  6 LET B=INT (RND*30)
  7 LET M=INT (RND*20)
  8 LET N=INT (RND*20)
  9 LET O=INT (RND*20)
 10 FOR F=0 TO 20
 20 PRINT "(32*isP)"
 30 NEXT F
 31 LET CO=0
 40 FOR F=0 TO 40
 50 PRINT AT INT (RND*20),INT (
RND*30);"(i.)"
 60 NEXT F
 62 DIM C(21,1)
 63 DIM D(21,1)
 70 FOR F=1 TO 21
 80 LET C(F,1)=INT (RND*20)
 81 LET D(F,1)=INT (RND*30)
 82 PRINT AT C(F,1),D(F,1);"O"
 90 NEXT F
 95 LET C=A
 96 LET D=B
110 PRINT AT 21,0;"INPUT DIRECT
ION ?"
```

CO-OPERATIVE effort went into devising **Inter-Stellar Traffic** for the 16K ZX-81 by Martin Pilborough, Mark Bailie and Mark Roberts of Needham Market, Suffolk. Move your ship — graphic A — through the galaxy, docking at each of the 20 planets and avoiding the black holes. You are invisible until you have made your first move.

Move by typing the appropriate direction — N, NE, E, SE, S, SW, W, NW — and then any positive number to represent your strength. Unforeseen hazards can strike at any time. Your controls are old and over-use can cause them to break down. Approaching the edge of the galaxy can send your steering haywire. Finally, there is the ever-present threat of the dreaded inter-stellar traffic warden.




```
 120 INPUT F$
 130 PRINT AT 21,0;"INPUT STRENG
TH ?      "
 140 INPUT G
 141 PRINT AT A,B;"(isP)"
 150 IF F$="N" THEN LET A=A-G
 160 IF F$="NE" THEN LET A=A-G
 161 IF F$="NE" THEN LET B=B+G
 170 IF F$="E" THEN LET B=B+G
 175 IF F$="SE" THEN LET A=A+G
 176 IF F$="SE" THEN LET B=B+G
 180 IF F$="S" THEN LET A=A+G
 190 IF F$="SW" THEN LET A=A+G
 191 IF F$="SW" THEN LET B=B-G
 200 IF F$="W" THEN LET B=B-G
 210 IF F$="NW" THEN LET A=A-G
 211 IF F$="NW" THEN LET B=B-G
 215 PRINT AT A,B;"(9a)"
 218 IF A=M AND B=P THEN GOTO 10
00
 220 IF A=N AND B=Q THEN GOTO 10
00
 221 IF A=O AND B=R THEN GOTO 10
00
 222 IF A=C(1,1) AND B=D(1,1) OR
 A=C(2,1) AND B=D(2,1) OR A=C(3,
1) AND B=D(3,1) OR A=C(4,1) AND
B=D(4,1) THEN GOSUB 3000
 223 IF A=C(5,1) AND B=D(5,1) OR
 A=C(6,1) AND B=D(6,1) OR A=C(7,
1) AND B=D(7,1) OR A=C(8,1) AND
B=D(8,1) THEN GOSUB 3000
 224 IF A=C(9,1) AND B=D(9,1) OR
 A=C(10,1) AND B=D(10,1) OR A=C(
11,1) AND B=D(11,1) OR A=C(12,1)
 AND B=D(12,1) THEN GOSUB 3000
 225 IF A=C(13,1) AND B=D(13,1)
OR A=C(14,1) AND B=D(14,1) OR A=
C(15,1) AND B=D(15,1) OR A=C(16,
1) AND B=D(16,1) THEN GOSUB 3000
 226 IF A=C(17,1) AND B=D(17,1)
OR A=C(18,1) AND B=D(18,1) OR A=
C(19,1) AND B=D(19,1) OR A=C(20,
1) AND B=D(20,1) OR A=C(21,1) AN
D B=D(21,1) THEN GOSUB 3000
 230 GOTO 100
1000 CLS
1002 PRINT "YOUR ENGINES HAVE BE
EN CLOGGED   WITH ******(BOGIES)
"
1003 PRINT "YOU HAVE BEEN FINED
BY THE       INTER-STELLA TRAFFIC
 WARDEN"
1004 PRINT AT 17,0;"IF YOU ARE U
NABLE TO PAY THIS     FINE YOU WI
LL BE MADE TO WASH    THE DISHES
FOR M.PILBROUGH       ESQ."
1010 PRINT AT 10,10;"(9*isP)";TA
B 10;"(isP:95)FINED (isP)";TAB 1
0;"(isP:95)£9,000(isP)";TAB 10;"
(9*isP)";TAB 14;"(isP)";TAB 14;"
(isP)";TAB 14;"(isP)"
1050 STOP
3000 LET CO=CO+1
3010 IF CO=22 THEN GOTO 4000
3020 RETURN
4000 CLS
4010 PRINT "YOU HAVE FINISHED"
```



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Celia Sims is one of the few women who have become fascinated by the ZX-81. She talks to Claudia Cook about plans for non-games uses

Making a useful home help from a small black box

HAD IT NOT been for her young son, Mrs Celia Sims admits she would never have had a computer in her home. As it is, she is fast becoming hooked on the idea of computers as home helps. It was last autumn when her two sons, Clive, aged 14, and nine-year-old Martin, met the magic of a computer for the first time. They were despatched to spend the weekend at a friend's house. The friend had a computer. Mrs Sims says:

"The boys were full of it from the moment they returned. They had spent the whole weekend playing games with the computer and they begged us to buy one".

Their father, John Sims, was against the idea of taking something so alien into the house and saw it as unnecessary. Finally, his wife says, he succumbed and presented Clive and his mother with a ZX-81 for their joint Christmas present.

"It is only a 1K and we really need a RAM pack but Clive and I are hooked already. Martin just likes to play games on it but Clive is already modifying the programs he gets from books.

"I am not interested in the games. I am just not into all that hand and eye co-ordination but when I think how it could help with my sewing, my knitting, even my shopping . . ."

It must be said that Mrs Sims, 38, is no ordinary seamstress. Having operated a full-scale sewing business from her home for several years with the help of three other people, she stopped working only when the local hospital telephoned asking her to tender for making all the nurses' uniforms.

"That was the final straw really. I just could not face the thought of doing dozens and dozens of grey dresses and my business was really getting too big. Now I do it more as a paying hobby than as a business, making all kinds of things, including ecclesiastical vestments. I also give talks on sewing to women's groups and the computer would be a marvellous visual aid for those. If you are trying to explain something complicated, like patchwork, you need dozens of drawings but the computer could show it all on a screen so much more clearly".

Mrs Sims also sees potential in a computer for providing simpler, more entertaining knitting instructions. She reckons it could save hours on the calculations for a pattern or embroidery design.

At present, though, that is a dream for the future. Certainly none of it will be possible until she has a printer and probably a bigger computer. Besides, Mrs Sims is also a busy wife and mother, caught in the turmoil of moving from the family bungalow at Great Yarmouth, Norfolk to Felixstowe, Suffolk.

When asked what her women friends think of her growing interest in computers, she says she does not see why it should be any different for a woman. She pauses, then says:

"I don't tell my friends about it. I would run out of language for one thing; they would not understand the jargon. None of them has a computer at home".

So far as her home computer goes, Mrs Sims is a woman among men but it is not for the first time. "I worked as a



computer programmer before I was married, although what I did is so out-of-date now that all this is new to me. In one office there were two women and masses of men. It was so different then. We did not have screens for one thing and now I am fascinated by the graphics. The language is different, too. I was really scared of it all at first."

Having taken a six-month course in computational mathematics and computer programming after leaving school, Mrs Sims programmed computers in two jobs. The first was for a computer manufacturer and she worked at a junior level on stock control programs. Her second job, "before computers were two a penny", was for the London Boroughs Management Services Unit, where the computer was responsible for a host of tasks, including the calculation of council pay rolls, rents, rates, mortgages and registers of electors.

"Now, of course, all the councils probably have their own computers. I was told at the time that things would change very rapidly and I am only surprised that people were not ready for the silicon chip when it arrived" she says.



Equipped already with a basic knowledge of computer programming but still with much to learn about the latest techniques, Mrs Sims feels there is a great need for systems analysts, a need she feels she might well help to fill one day.

"I am a little concerned about school teachers, for example, using computers and making programs which work but are not structurally all they could be. It is not happening yet but I am sure it will. In language laboratories, for example, where a teacher qualified in French then starts writing programs but with a limited knowledge of computers".

Mrs Sims feels there is a lack of forethought in some of the programs written today, even for games. Her son Clive, she says, frequently finds programs which do not do all they should and he settles down to adapt them.

"This is the first time Clive had anything to do with computers and he has used ours every day since Christmas. If there is a problem I help him but that just means both of us going through the manual until we work it out. It is all too different for my early training to be much good.

"I have written one program but it was very simple, a version of Connect Four for the 1K, because there seemed to be one only for the 16K.

"I had to look up everything first in the manual and I suppose it took me a day to sort it all out. Then the program did not take long at all".

Mrs Sims is determined that any bigger computer she might buy must pay for itself and, to that extent, she views it as a commercial proposition. She feels strongly, however, that computers should not be seen simply as for commercial application. They should be used, too, as visual aids, and as potential assistance in the home.

"I would like to encourage women to try. Many still take the attitude that nothing beats a pencil and paper but if I had a printer I would certainly use the computer for my shopping list.

"I go shopping only once a month and I have a list of what I have left in my kitchen rather than what I need to buy. Then I replace what has gone, as well as keeping my eye open for bargains. I have a kind of built-in recorder list in my head which it would be much better to have on the computer".

Mrs Sims feels that few women will go and buy themselves a home computer but once their children take one into the home, they should not ignore it.

"I know people who have a very complicated sewing machine capable of all kinds of things and yet they use it only for simple sewing. Somehow they think it does simple sewing better. To me that is a waste. If you have a machine like that in the house, why not explore its potential? The same with a computer".

> 'I would like to encourage women to try. Many still think that nothing beats a pencil and paper but if I had a printer I would use the computer for my shopping list'

Mrs Sims fully expects to see the time when far fewer people need to leave their homes to go to work — when, with comprehensive programs available, many more parents might consider teaching their children at home, with the help of a computer.

She acknowledges that school is a great help to many children for its social contacts, if nothing else, but she praises the ZX-81 for the change it has already effected in her own son.

"He has always been very quiet, a loner really, and he has never seemed particularly interested in any one thing, but since Christmas he is a changed person. He talks non-stop about computer programs and how he will modify them. He really seems to have a feeling for it.

"He enjoys the games, as does Martin, but he is more interested in the whole idea of programming and he has learned a great deal about it very quickly".

It looks as if, between them, Mrs Sims and her sons will soon master the complexities of computers but she sees nothing unusual in that.

"I admit I was scared by the language at first until I discovered that you just have to bludgeon people. Once you know that interface simply means a link, you begin to realise it is all simple, really.

"Even the language of physics and electronics deters many women but it need not. Women can master computers as well as any man".

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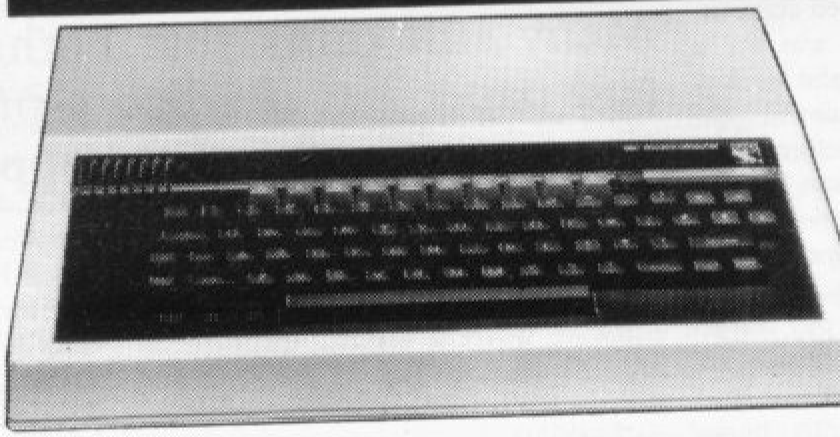
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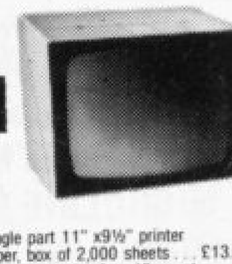
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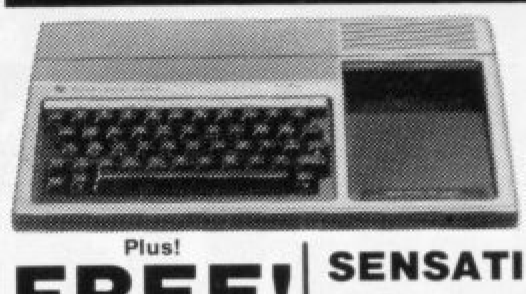
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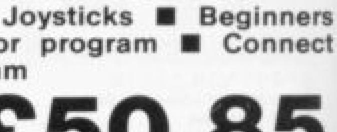


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Overtures out of the Spectrum BEEP

This extract by Ian McLean is from the *ZX-Spectrum — Your Personal Computer*



SPECTRUM SOUND is very simple to use. There is only one instruction, BEEP, which has two parameters. The first determines the length in seconds the sound lasts. The second determines how high or low the pitch of the sound. The first number must be positive and the second may be anywhere within the range −60 to +69. The higher or more positive the pitch parameter, the higher — more squeaky — the sound will be.

Those who are not familiar with musical notation, however, may be deterred by the task of converting sheet music to Spectrum commands.

Rule one is to stay with simple tunes and tunes you know.

The Spectrum is not a symphony orchestra. It sounds best when playing tunes with a simple, catchy and easily-remembered melody.

Even simple tunes can look daunting on sheet music. For a start, there are usually two sets of five lines joined together, as in figure one.

You will see that the top set of lines starts with the symbol 𝄞 , while the bottom line starts with the symbol 𝄢 .
𝄞 is the treble clef;
𝄢 is the bass clef.

Rule two is to ignore the lines starting with the bass clef. Thus the music is simplified to figure two.

Your problems are not yet over. As you probably know the symbols of the form ♩ stand for musical notes. You will see, however, that most of the notes in this tune are of the form ♩ .

Much of the sheet music you see will have this kind of multiple note. That is because the tunes are written so that they can be sung in harmony.

Rule three is that when dealing with harmony, ignore all except the top notes. Thus the music is further simplified to figure three.

Now I will have to cover a little musical theory. Look at the five lines. Again you may know that notes written near the top five lines are of a higher pitch than those written near the bottom. For convenience, notes are given names which determine their pitch. Those names consist of the letters A to G. Thus the position of a note on the lines can be represented by a letter, as in figure four.

You will probably have heard of the musical scale
doh, re, me, fah, soh, la, te, doh.
The eight notes of the scale are called an octave. The scale of C is the octave which starts and ends with C. That is:
C=doh, D=re, E=me, F=fah,
G=soh, A=la, B=te, C=doh.

Similarly, the scale of A starts and ends with the note A. There is, however, a complication. Not all the steps in frequency — changes in pitch — between the notes are the same. For example, the change in pitch between the notes B and C is only half of the change in pitch between C and A. To allow for that a scale or octave is split into 12 semitones:

A
A♯ or B♭
B
C
C♯ or D♭
D
D♯ or E♭
E
F
F♯ or G♭
G
G♯ or A♭

The symbol ♯ means 'sharp' and ♭ means 'flat'. So G♯ is a semitone higher than G and A♭ is a semitone lower than A. G♯ is the same note as A♭ .

I shall not deal with scales in detail; suffice it to say that the scale which sounds correct to most of us is the major scale. That goes up in semitone steps:
doh (2 steps) re (2 steps) me (1 step)
fah (2 steps) soh (2 steps) la (2 steps)
te (1 step) doh

So that the scale of C Major is C, D, E, F, G, A, B, C; and the scale of G Major is G, A, B, C, D, E, F♯, G.

When you know what semitones are and what an octave is you can make sense of the second pitch parameter in the BEEP instruction. That parameter defines the pitch in semitones above and below the note Middle C. If you want to know what Middle C sounds like, enter the command BEEP 1,0 on
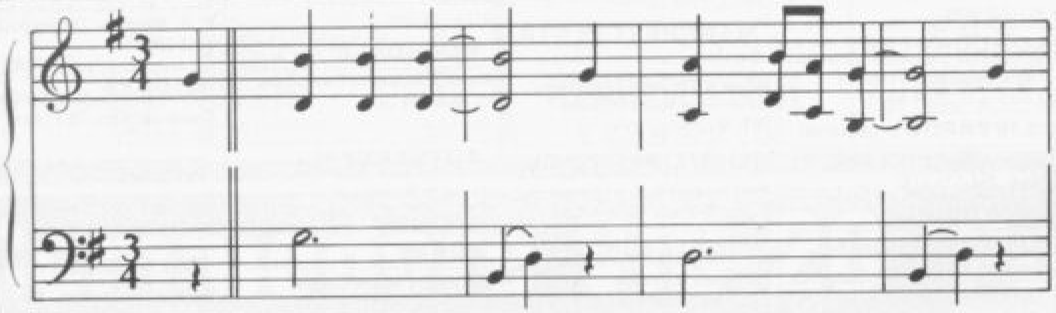


Figure 1.
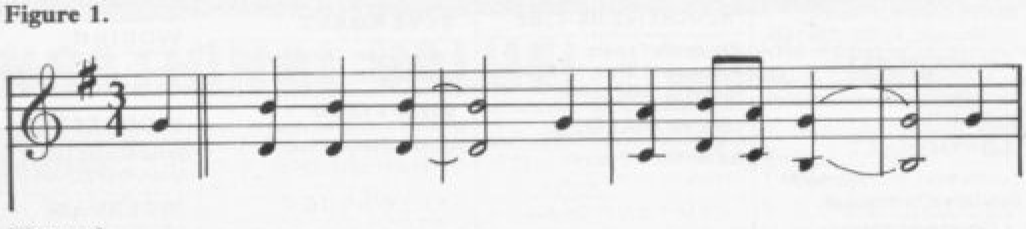


Figure 2.
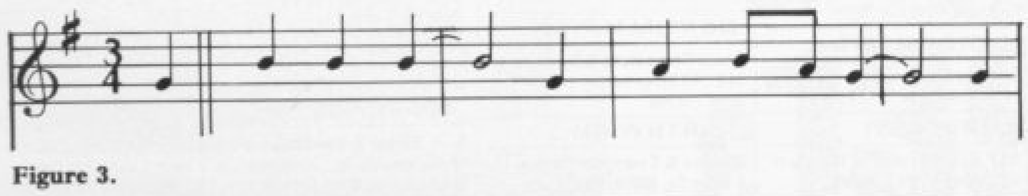


Figure 3.



your Spectrum. You will probably have appreciated by now that adding 12 to the pitch parameter raises the note by 12 semitones or one octave. So BEEP 1,12 will give the note C one octave higher than Middle C. So we can define notes using BEEP parameters.

Note	Parameter
A	−3
A♯	−2
B	−1
C	0
C♯	1
D	2
D♯	3
E	4
F	5
F♯	6
G	7
G♯	8

Reverting to musical notation, and taking a few lines below and above the five-line stave to give the normal range for most tunes, results in figure five. Note that you will have to adjust the numbers for sharps and flats — add 1 for sharp, subtract 1 for flat — written at the start of each line.

In some tunes you will find sharp and flat symbols written in the middle of the line. You will also find the symbol ♮ which converts a note to its natural value if it is normally sharp or flat. Symbols in the middle of the stave are called accidentals and affect any notes on the line or space on which they occur until the next vertical line — that is until the end of the bar in which they appear.

Rule four is to avoid tunes with a number of accidentals. Having looked at the pitch of the note, we will consider its duration. It is normal to define a single beat note as ♩ — this is called a crotchet. A half-beat note is ♪ — a quaver. A quarter-beat note is 𝅘𝅥𝅯 — a semiquaver.

Sometimes the tails of the notes are joined, i.e.

♫ is two half-beat notes.

♬ is two quarter-beat notes.

A double-beat note is written 𝅗𝅥 — minim. A four-beat note is written 𝅝 — semibreve.

A dot after the note increases the duration of the note by half as much again, for example:

♩. is a one-and-a-half beat note;

𝅗𝅥. is a three-beat note.

Sometimes you will see notes linked by a curved line. If the notes are of the same pitch and next to each other they should be treated as a single note. If they are different pitches, or if there are notes between them, they should be treated as two separate notes.

Finally we reach rests. As the name implies, they are pauses in the music. There are two of them:

𝄽 — pause for a single beat.

𝄾 — pause for a half beat.

Initially it is easiest to give a single-beat note the value 1. That will tend to lead to very slow tunes but I will demonstrate a way to deal with the difficulty.

Note the figure after the treble clef at the start of the music. Usually this is 2/4, 3/4, 6/8, or 4/4. The symbols C or ₵ are sometimes used to denote 4/4 time. For the sake of simplicity you can take 6/8 as being the same as 3/4. There are differences but we are not delving deeply into musical theory.

To check your beat values, count the number of beats in a bar, i.e., between two adjacent vertical lines across the whole of the stave. The number of beats to the bar should equal the top figure, i.e., 2/4 time has two beats per bar; 3/4 time has three beats per bar; and the like.

Then you are ready to change the music into BEEP commands. For each note write first the number of beats and then the pitch as in figure six.

So the instruction:

```
10 BEEP 1,7: BEEP 1,11: BEEP 1,11:
   BEEP 3,11: BEEP 1,7: BEEP 1,9:
   BEEP .5,11: BEEP .5,9: BEEP 3,7:
   BEEP 2,7
```

would play the notes but rather slowly. A better speed would be obtained by:

```
10 BEEP .66,7: BEEP .66,11: BEEP
   .66,11: BEEP 2,11: BEEP .66,7:
   BEEP .66,9: BEEP .33,11: BEEP
   .33,9: BEEP 2,7: BEEP 2,7
```

The method of writing tunes shown in the foregoing program is satisfactory for a few notes. It can, however, become tedious for a long tune, especially if you wished to vary the key or tempo of the music. A more flexible approach would be:

```
10 FOR n=1 TO 10
20 READ a,b
30 BEEP a,b
40 NEXT n
50 DATA  .66,7, .66,11, .66,11, 2,11,
         .66,7, .66,9, .33,11, .33,9,
         2,7, 2,7
```

The advantages are not immediately obvious but look what happens if you replace a by a/3. Line 30 becomes:

```
30 BEEP a/3,b
```

and line 50 becomes:

```
50 DATA  2,7, 2,11, 2,11, 6,11, 2,7,
         2,9, 1,11, 1,9, 6,7, 2,7
```

That greatly simplifies entry, especially for a long tune.

Rule five is to give the shortest note in your tune a value 1. Adjust the tempo in your BEEP statement. That avoids decimals in your data.

In this program p must be positive and q may be either positive, negative or zero. Neither p nor q need be whole numbers.

Finally, you can arrange the program so that you do not have to press RUN and ENTER every time you want to hear the tune.

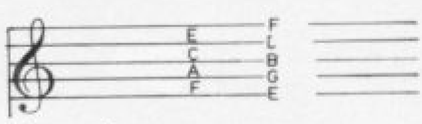


Figure 4

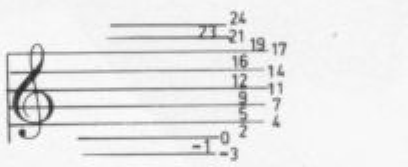


Figure 5.

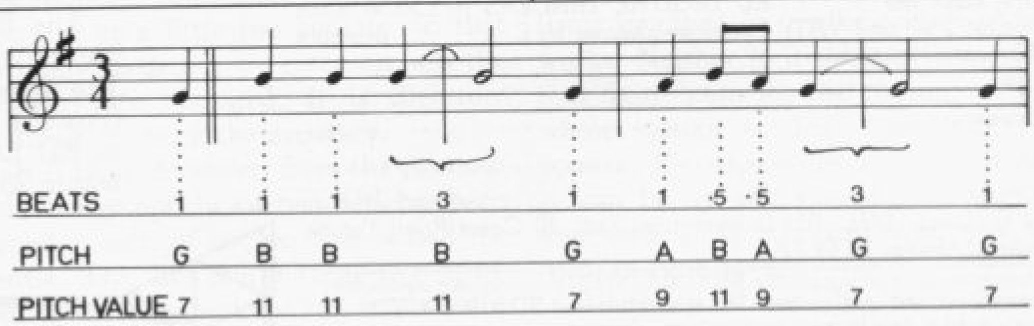


Figure 6.

New ground broken by powerful architects' aid

Sinclair machines are regarded still as little more than toys. David Marsh disagrees in this review of a new cassette

APART FROM generalised spreadsheet programs of the Vu-calc and Vu-file variety, there has been little or no Spectrum software written for serious commercial applications. Something of a new departure in that direction is a specialised program, Beamscan, which is used to calculate the sizes of steel beams used in building construction.

The program is used interactively, with the screen prompting the user at all stages and asking for details of the loads. A diagram of the beam is displayed on-screen, which makes it clear exactly what information is being requested by the computer. The program seems well error-trapped and user-friendly. When all the data is in, there is a wait of about one minute while the numbers are crunched and then diagrams are displayed giving shear force and bending moment along the beam.

From its library of standard steelwork sizes, the program recommends a choice of up to eight suitable sections with stress and deflection for each. All the regular rolled steel joists, universal beams, universal columns and rolled steel channels in grade 43 steel are featured and a moment of inertia can be obtained for timber beams, from which it is a simple matter to choose a suitable section.

The beam must be simply-supported and single span. Cantilevers are not within the scope. That is perhaps the only limitation worth mentioning. Any combination of point loads, distributed loads and uniformly-tapered loads in any number up to a total of 99 can be specified.

What is more, the distributed loads do not have to extend to the end of the beam. Within the designated span of 0.3 to 20 metres, it is difficult to visualise any beam which could not be analysed by the program.

Point loads frequently consist of the end reactions of other beams. Both end reactions are given, which covers that point and also is a great help in finding the stress in any supporting brickwork. Also given are the maximum bending moment and shear force, the deflection co-efficient, the permitted deflection and optimum moment of inertia.

That would mean that other types of beams, for example round or rectangular hollow sections, could then be chosen using the data given in BS4.

For each beam size chosen, the L/ry and D/T ratios are given, together with



permissible and actual stresses, actual shear stress and deflection.

All that information can be put into the form of a calculation sheet using the ZX printer. That can then be submitted to the client or to the local authority responsible for checking the design. Although full data is given on the results and the presentation is clear and concise, perhaps some local authorities may consider it a little too concise, in that virtually no details are given on how the answers are obtained. It is therefore difficult to check the accuracy.

It is clear, however, from the printout whether or not the correct data has been typed-in and, of course, that is half the battle. The fact that a computer printout is being submitted rather than the more usual written calculations should lend a reassuring air of professionalism.

It is also probable that in the perhaps not-too-distant future when most calculations are made in this fashion, various programs will become widely-known and generally accepted in the profession as being accurate. Some kind of type-approval system might even be possible so that checking would be limited to the data output.

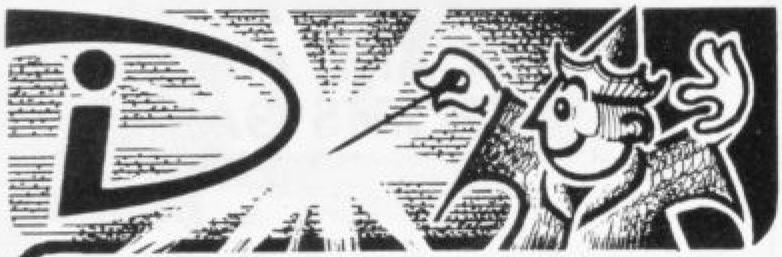
That would be in line with the procedure followed in other areas, where certain materials, for example building blocks, are given a certificate to indicate that they comply with building regulations. If that make is used, then no further proof is required that they meet the requirements. Extending the concept to software seems logical and almost inevitable.

Beamscan is supplied recorded on both sides of the cassette and is suitable for a 48K Spectrum, being about 35K. It is supplied with a well-written manual which guides the user through a worked example and describes the limitations of the program as 999KN for each load to a maximum total load of 10,000,000KN from the 99 loads mentioned. They scarcely seem like limitations when there are other costlier beam design programs for bigger computers which cater for a maximum of eight point loads while others cannot calculate the shear force or bending moment.

At £25, it appears costly compared to the usual programs in *Sinclair User* but it is a more specialised item with a lower volume sale than games or spreadsheets and is much less expensive than anything comparable.

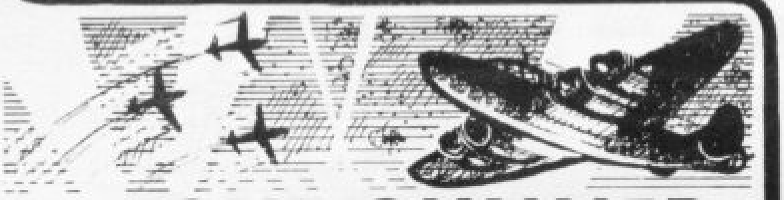
It should be ideal for small architectural practices or the many one-man firms involved in smaller-scale building works. Neither is it necessary to pay a four-figure sum for the computer. The whole system — 48K Spectrum, ZX printer, TV, tape recorder and software — can be up and running for slightly less than £300 and will soon pay for itself in time saved.

Beamscan is available from Beamscan, 20 Vaughan Avenue, London, NW4 4HU. Tel: 01-202 8656.



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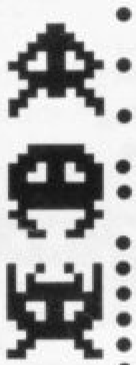
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John Gilbert reviews the latest titles on the bookshelf

Guides for beginners

PUBLISHERS are beginning to realise that there are few general introductory books to computers on the market. Several new titles have been released in the last few months and they have steered clear of introductions to specific machines.

The Pre-computer Book by F A Wilson is published by Bernard Babani. The book has an odd title but that is the only strange thing about it. Wilson provides an introduction for the complete beginner. The concept of the computer is examined, together with such diverse subjects as number bases, hardware and simple programming. As a result it covers a great deal in very few pages.

The book will satisfy your curiosity if you want to know what a byte is or where to find the ROM of a machine, but if you are looking for very detailed information, this general guide is not for you and does not pretend to be.

The Pre-computer Book costs £1.95 and is one of the least expensive books which have been reviewed to date.

Another book for the complete beginner is *Programming for Real Beginners* from Shiva Publishing. The author is Philip Crookall. It is a general introduction to computers and does not stay on the theme of programming. It may be useful to someone who is beginning a course in computer studies and would suit anyone doing CSE or O level. It is available for £2.95.

For people who want to go a few stages further, Century Books thinks that it has provided the definitive text on Sinclair machines with its *Century Computer Programming Course.* What it has done is to publish a massive tome of text which is not indexed in any way. The book contains some interesting information on both machines but there is no way to find the information quickly. A proper index would, most probably, occupy another 10 pages.

While the expansion into the general sector of the market has been taking place, more Spectrum books have appeared. The state of play seems to be that anyone will do anything for a Spectrum.

The Century Computer Programming Course is written by Peter Morse, Ian Adamson, Ben Anrep and Brian Hancock. It costs £9.95 and is well worth the money.

The recent release of the *Complete Spectrum ROM Disassembly,* by Dr Ian Logan and Dr Frank O'Hara, must be a great relief to many machine code programmers who want to get to grips with the Z-80A processor inside the machine.

The book is published by Melbourne House and gives a detailed breakdown of all the routines in the ROM, including information on I/O routines, arithmetic and floating point calculations and the re-start routines at the beginning of the ROM.



The Complete Spectrum ROM Disassembly costs £9.95. It is slightly overpriced, although the information is worth having.

A book on machine code, *Spectrum Machine Code,* has been published by Shiva. The authors are Ian Stewart and Robin Jones and their handling of the subject is excellent, so far as it goes.

The book is very thin, although it provides a great deal of information. The chapters on the display and attribute files of the Spectrum are very interesting and will be of immense value to anyone who wants to use machine code graphics within programs.

Spectrum Machine Code is part of the Shiva Friendly Micro series and costs £5.25.

Advanced Graphics with the Sinclair ZX Spectrum by I O Angell and B J Jones is published by Macmillan Press. The authors are obviously academics, as the book seems to be aimed at those with a great technical understanding of the Spectrum and also a knowledge of Cartesian co-ordinate geometry. It is written rather like a treatise, with many references to other books in the main text.

It is well-presented and provides plenty of technical information. The authors show how to develop arcade-quality graphics and also go into the realms of three-dimensional animation. The problem is that many Spectrum users would lose their way in the book, not because of any failing on their part but because of the authors' narrative style. *Advanced Graphics with the Sinclair ZX Spectrum* costs £9.95.

The ZX Spectrum — Your Personal Computer is published by Prentice/Hall International and written by Ian McLean, Simon Rushbrook Williams and Peter Williams.

The first third of it is taken-up by drawings of the Spectrum keyboard with marks showing the relevant key positions. Some readers may regard that as an insult to their intelligence, as all of those key functions are marked clearly on the Spectrum.

There are, however, several redeeming features. The text is clearly set out and the examples are excellent. The chapter on loading and saving programs is useful but merely repeats the one in the Spectrum manual.

It is a useful adjunct to the Spectrum manual and costs £5.95.

Melbourne House (Publishers) Ltd, Glebe Cottage, Glebe House, Station Road, Cheddington, Leighton Buzzard, Bedfordshire, LU7 7NA.

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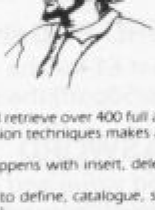
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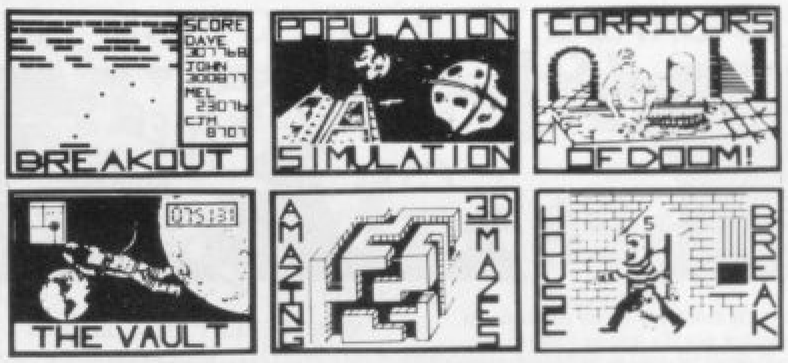
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Here are descriptions of just a few of the games:

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CORRIDORS OF DOOM! A dungeons & dragons type game that is very addictive. You can never win this game by chance. A lot depends on discovering the secrets of just how you have to deal with each individual monster in the game. There is a liquid which will destroy the Were-Wolf — but which one? How can you tame the giant spider? Will you ever learn the secret of how to defeat the Blood Devil? All of the monsters have treasures for those who are both brave and wise enough to overcome them, but to escape alive you must first cross some very nasty pits. Play it again and again.

AMAZING 3D MAZES: Wander through the giant 18 × 18 × 18 mazes collecting treasures, you know where they are, but how do you get to them? Extra points are awarded for finding the shortest routes. Don't get too frustrated by apparent dead ends.

3D NOUGHTS & CROSSES: Played inside a 4 × 4 × 4 cube, this is a game for the intellectual. Great graphics. It plays a mean game and wins about nine out of every ten games it plays.

TOWERS OF HANOI: You will welcome this classical puzzle which is a must for anyone with a computer. The problem difficulty depends on how many disks you use. It might only take you a few minutes with four disks, but with all nine it could take all day. Two variations of the game are included. There is a constant display of Hours, Minutes and Seconds, so that you know how well or how badly you are doing at any particular stage. If you find you cannot work the problem out! The computer will show you the shortest possible solution.

THE VAULT: A high security vault in Oxford. The game can be changed to centre around your own home town) has ten doors, each with its own five figure combination. The combinations of the nine inner doors are known, but only the manager knows the combination of the outer door. Unfortunately the manager has got himself locked in the Vault. It is your job to get him out before all the Oxygen is used up. The computer will give you metaphorical clues as to how near you are getting. The time switches which change the combination every so often can prove a problem. This is a case which really puts your powers of logic to the test.

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Dilwyn Jones explains the workings of system variables

Sorting through memory for some useful addresses

SYSTEM VARIABLES are the bytes in memory from address 16384 to address 16508 in RAM on the ZX-81. They are used by the computer to remember certain things about its workings, such as where to print next.

You can make use of some of them in your programs either by reading their value — PEEKing — or replacing them with new values — POKEing — so as to use the information they contain or make the computer do something it might not otherwise do.

Not all of them can be used in this way; some may ignore you, whereas changing the contents of some of them may cause strange effects, like making a mess of the screen display. At worst, a little nasty known as a crash may be caused.

● **16384 ERR-NR (Error report number).** The value contained in address 16384 determines the report code. If you POKE a number into 16384 which is anything other than 255, the program will stop and display an error code, which may be non-standard but meaningful in some way.

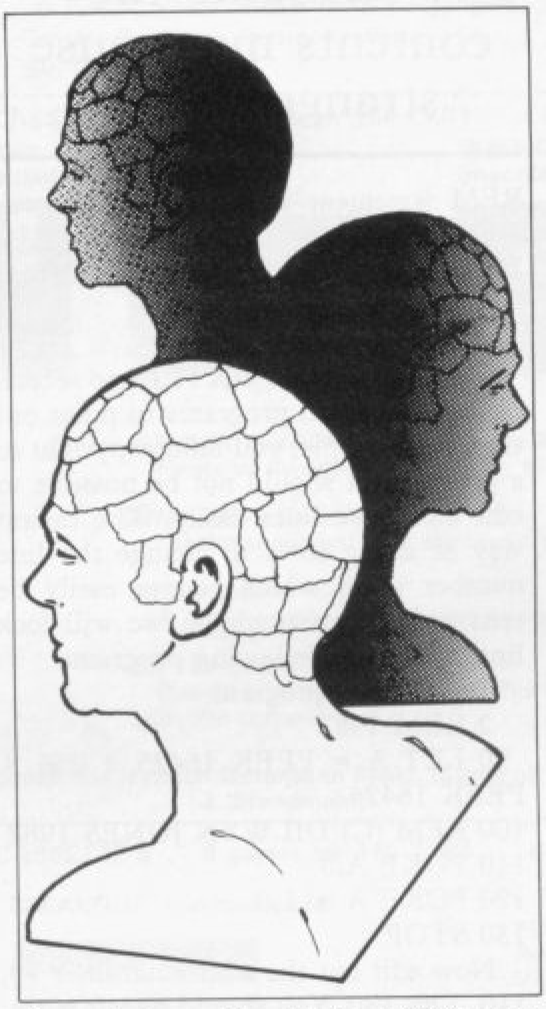
For example, if you wanted to arrange that if the user entered an incorrect value the program stopped with error U — standing for USER ERROR — you would arrange that POKE 16384,29 was executed. To determine which value to POKE, remember that 16384 has a value of 1 less than the report code.

The error report code can be suppressed by POKEing certain values into this system variable. That may be useful at exhibitions, where a report code may be an unsightly distraction from the rest of a display. Experiment with POKEing some of these numbers into 16384: 43, 70, 72, 73, 74, 75, 76, 77, 79, 81, 82, 89.

● **16386/7 ERR-SP.** This system variable contains the address of the first item on the machine stack after the GOSUB returns. With PEEKing this two-byte system variable you can check how many GOSUB return addresses are present on the stack, for example to check if any bug in your program had been causing it repeatedly to call and jump out of subroutines. Here is how to check:

PRINT (PEEK 16388 + 256 × PEEK 16389) — (PEEK 16386 + 256 × PEEK 16387)

● **16388/9 RAMTOP.** RAMTOP is the address of the first byte of memory



above that used by Basic. NEW operates only this far, so anything placed above RAMTOP is safe from every Basic function except POKE — that is how you would put it there. That makes it ideal for storing machine code or data you want to pass between two programs, so that it is not lost when you execute normally-destructive commands like LOAD or NEW. On a 1K ZX-81, 16388/9 have the values 16388 0 16389 68.

Using the formula from chapter 28 of the ZX-81 manual, 0 + 256 × 68 is 17408. That is the normal address of RAMTOP in a 1K ZX-81. If you have a RAM pack plugged in and wish to see if a program you have would fit into 1K, it may be tested by POKEing the foregoing values into RAMTOP, then entering the command PRINT USR 1040. The machine will behave like a 1K ZX-81.

The value contained in RAMTOP also determines how the display file — screen picture — is made up after CLS. If the value in RAMTOP is less than 19712 — 16388 = 0, 16389 = 77 — the display file is contracted to minimum size consisting of only 25 NEWLINE characters. If RAMTOP is 19712 or higher, the display file is expanded by filling with spaces. A contracted display file has the advantage that it takes five seconds less to LOAD or SAVE programs.

● **16391/2 PPC.** Contains the line number of the statement being executed. It could be used as an aid to debugging a program which has computed GOTOs/GOSUBs all over the place; a few PRINT PEEK 16391 + 256 × PEEK 16392 statements here and there could determine whether or not the program went where you thought it should do.

In the last line of a program it determines the line number to be printed by the report, e.g., 0/100. You may like to use that to print a score on the screen at the end of a game.

● **16396/7 D-FILE.** Contains the address of the start of the display file. The character pointed to is the first NEWLINE character in the display file. Since the display file floats above the program in memory, you can use it to tell you where the program ends, giving you an indication of the length of the Basic program, since the Basic program starts at 16509: PRINT PEEK 16396 + 256 × PEEK 16397 - 16509 will tell you the length of the program in bytes.

If you want to PEEK/POKE into the display file for any reason, this system variable helps you by telling you where in memory it starts.

● **16398/9 DF-CC.** Tells you where in memory the current PRINT position lies. PEEK 16398 + 256 × PEEK

16399 gives the address in RAM of the current PRINT position. That could be POKEd to change the PRINT position. Alternatively, if you PEEKed the address of the PRINT position, you would obtain the CODE of the character already at that position — useful for detecting collisions and so on in games, or for programs which require a screen cursor to be highlighted in inverse video such as word processors:

LET AS = CHRS (PEEK (PEEK 16398 + 256 × PEEK 16399))

IF AS >="A" AND AS<="Z" then print at Y, X; CHRS (CODE AS + 128)

The statement PRINT AT Y,X; moves the cursor without printing.

● **16400/1 VARS.** This pair of system variables enables you to find the address of the start of the variables area if you want to go PEEKing or POKEing around, or the end of the display file if you want to work backwards to POKE characters on to the bottom two lines of the display which cannot normally be PRINTed upon.

● **16404/5 E-LINE.** Contains the address of the end of the variables area. We can examine it to give a rough idea of how much memory we have used, including system variables, program, display and variables:

PRINT PEEK 16404 + 256 × PEEK 16405 - 16384

● **16412/3 STKEND.** Contains the address of the top end of the calculator, immediately below spare memory. Used in conjunction with ERR-SP 16386/7, we can obtain an approximate idea of how much memory we have left in which to work. PRINT (PEEK 16386 — PEEK 16412) + 256 × (PEEK 16387 - PEEK 16413) The figure is in bytes.

● **16417 not used.** This system variable is not used but is available to the user; you could use it to store information in the form of an integer from 0 to 255. That would be saved on tape when the program is saved.

● **16418 DF-SZ.** Define screen size, or the number of lines in the lower part of the screen. If you POKE a value of 1 or 0 into this system variable you can use lines 22 and 23, so that PRINT AT 22,0; and PRINT AT 23,0; become acceptable statements. If using INPUT or SCROLL, you should restore the original value, normally 2, or you may cause a crash. Conversely, if you are short of memory and using a SCROLLing display, you can make scrolling start from further up the screen by POKEing a value greater than 2 into 16418, a Basic part screen scroll.

● **16419/20 S-TOP.** This contains the number of the top line in automatic listings. Automatic listings are those produced when you press NEWLINE. It can be annoying when you are trying to work on one part of a listing and the computer insists on displaying a different part.

To place any line number you want, say line X, at the top of auto listings you must first move the cursor to a line number greater than the one you want at the top. Then enter the commands:

POKE 16419,X — INT(X/256) × 256
POKE 16420,INT(X/256)

● **16425/6 NXTLIN.** The address of the start of the next program line. You could use it to run machine code in a REM statement anywhere in the program, e.g.:

```
100 LET A = USR (PEEK 16425 +
256 × PEEK 16426 + 5)
101 REM . . . machine code . . .
```

'Changing the contents may cause strange effects'

Or you could use NXTLIN to security lock lines into programs to point out that, for example, you hold copyright to a program. It should not be possible to edit out those lines easily. The easiest way of doing so is to change the line number to 0, which cannot easily be removed. As an example, we will lock line 100 in the following program:

```
1 REM any program
2 REM 1982
90 LET A = PEEK 16425 + 256 ×
PEEK 16426
100 REM (C) DILWYN JONES 1982
110 POKE A,0
120 POKE A + 1,0
130 STOP
```

Now edit out the additional lines 90, 110, 120, 130. You should be left with:

```
1 REM any program
2 REM 1982
0 REM (C) DILWYN JONES 1982
```

Note that the lines are not necessarily in the correct order but that will not affect listings or the running of the program.

● **16436/7 Frames.** This is a frame counter which counts the frames of a picture sent to a TV set. It is incremented 50 times a second and can be used for timing with a range of about 11 minutes before repeating. To set the timer initially we use:

POKE 16437,255
POKE 16436,255

They may be entered as direct commands or used as program statements, although of more use within programs because of the limited timing range. The values of the frame counter start at 65535 and count down to 32768, because bit 15 is normally 1. Once it has been re-set, its value is read like this to give a value in seconds: LET TIME-=(65535-PEEK 16436-256*PEEK 16437)/50

The variable TIME then contains the time elapsed in seconds since the frame counter was re-set.

Remember that PAUSE uses the frame counter, so you cannot be timing and use PAUSE, too. If you want a delay while using the frame counter for timing, use a FOR/NEXT loop of about 1 to 60 for every second of delay. Remember also that bit 15 should always be 1 when timing. If both bytes of the frame counter reach zero, the program will crash.

● **16441/2 S-POSN.** After you use PRINT at Y,X; where Y and X are print co-ordinates:

PEEK 16441 would be 33-X
PEEK 16442 would be 24-Y

16441 contains information as to the PRINT column number but it is not very easy to use. If X is 0 — the PRINT position is somewhere on the left-hand side of the screen — the value of 16441 starts at 33 and decrements by 1 for every column across the screen. The value of 16442 starts at 24 if the PRINT position is at the top of the screen and decrements by one for every line moved down the screen; 16441 may be used in programs which handle text.

It may be necessary to determine whether there is room for a word on the current line or if it is necessary to move to a new line to prevent the word being chopped in two. Suppose the word to be printed was A$. To prevent A$ being chopped in half you could use:

IF PEEK 16441<LEN A$+1 THEN PRINT

always assuming, of course, that the previous PRINT item ended in a semi-colon or comma. It may help to think of 16441 as the number of characters+1 which can still be printed on this line of the screen.

● **16444 to 16476 printer buffer.** If the printer is not used, may be used to store information if you have nowhere else to put it.

● **16507/8 not used.** These two unused system variables can be used by the programmer to store integers if needed. They are saved on tape along with the program.

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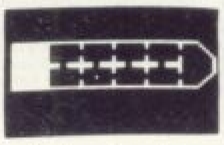
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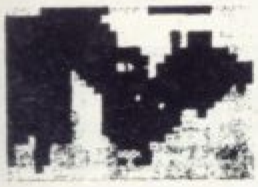
CUBE Rubik Cube simulator, with lots of functions including 'Backstep'.

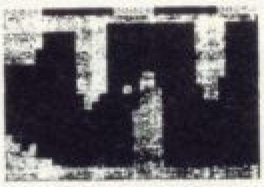
SECRET MESSAGES This message coding program is very txip qexi jf.

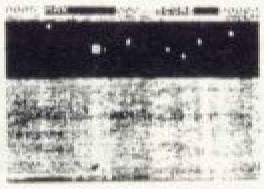
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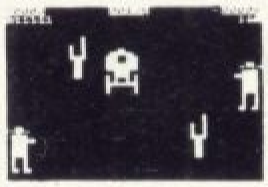
ZX-SCRAMBLE (machine code) with 3 stages.
Bomb and shoot your way through the fortified caves.



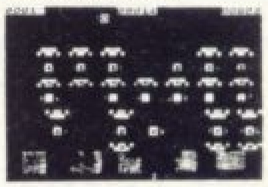


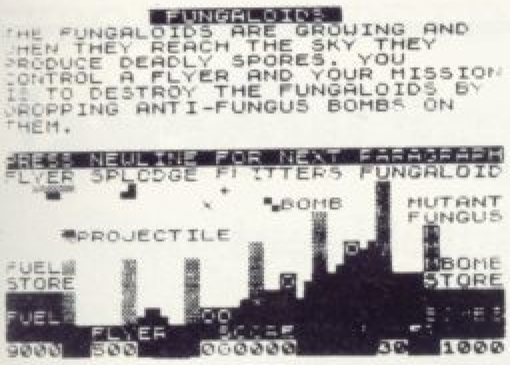


GUNFIGHT
(machine code)



INVADERS
(machine code)





GALAXY INVADERS (machine code)
Fleets of swooping and diving alien craft to fight off.

SNAKEBITE (machine code)
Eat the snake before it eats you. Variable speed. (very fast at top speed).

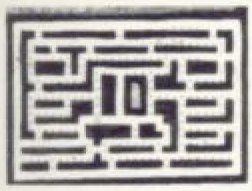
LIFE (machine code)
A ZX81 version of the well known game.

3D TIC-TAC-TOE (Basic)
Played on a 4 × 4 × 4 board, this is a game for the brain. It is very hard to beat the computer at it.

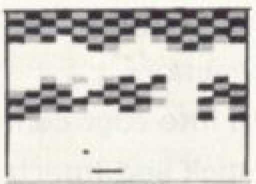
7 of the 8 games are in machine code, because this is much faster than Basic. (Some of these games were previously available form J. Steadman).

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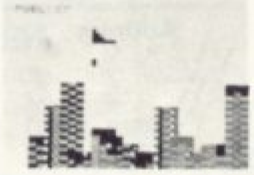
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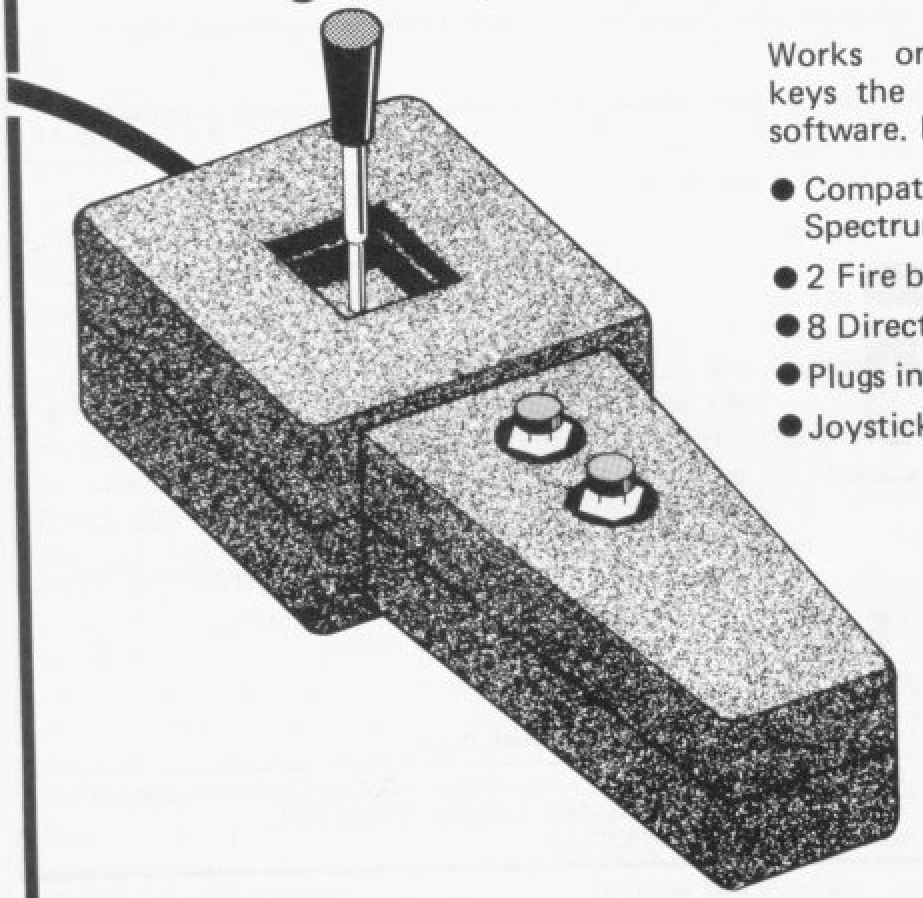
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GLOSSARY

Basic — Beginners' All-purpose Symbolic Instruction Code. A programming language resembling English which is used by beginners because most popular microcomputers have it as standard.

Bug — an error in a program.

EPROM — Erasable Programmable Read-Only Memory. Semi-permanent storage. Information is not erased if the power is turned off in the computer. Programs can be erased by subjecting the memory chips to ultraviolet light. The memory can then be re-programmed using an electrical device called an EPROM blower.

Interface — RS232 and Centronics. A device which enables other computers or add-ons, such as printers, to be connected to the computer. It converts non-standard signals from add-ons to the standard signals of the computer in use.

Kilobyte — (K). A measurement of memory size. Most machines use 16K as a minimum but 48K is generally agreed to be necessary for serious work.

Machine code — an electronic pulse code used by the computer to perform functions and communicate with memory and other devices.

Mnemonics — abbreviated instructions — for example LD for Load — used in machine language programming.

Motherboard — an external printed circuit board which is used like a multi-way plug planner. It enables other printed circuit boards, such as graphics boards and colour boards, to be slotted-in.

Port — a link to the outside world which can be used by programs and the computer.

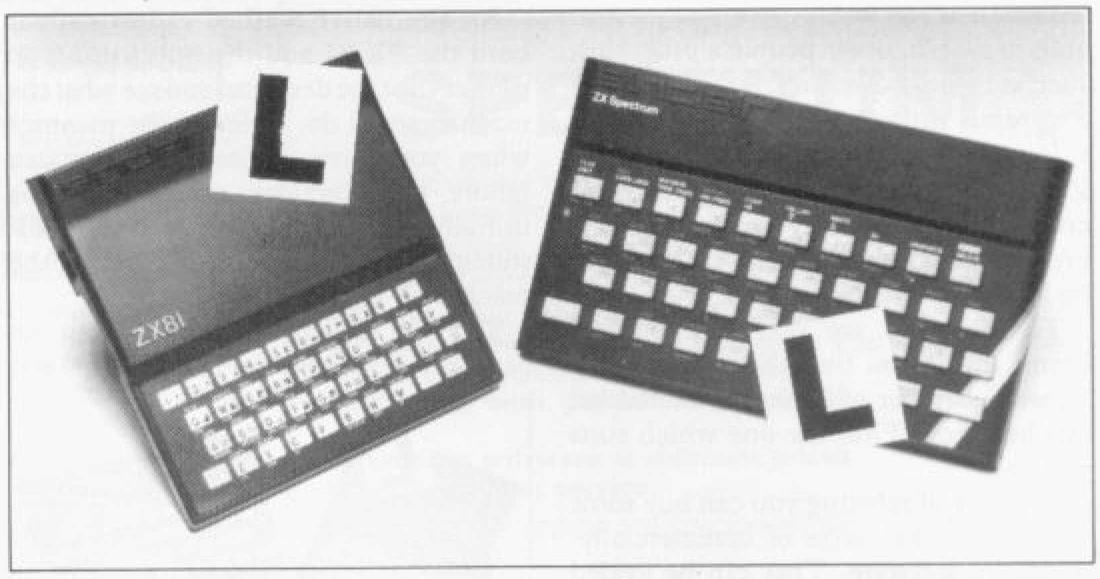
PCB — printed circuit board. A board which has on it the electronic circuits of the computer.

RAM — Random Access Memory. Information and programs can be stored in this type of memory as electronic pulses which conform to a set of numbers — machine language — in which programs are represented in the computer. When the power is turned off the information will be lost.

ROM — Read Only Memory. Information stored in this type of memory is not lost when the power is switched off.

Software — programs which control the operation of the computer.

Syntax error — a bug caused by incorrect use of a programming language.



Our easy-to-follow guide for new owners

The basic route to a habit-forming hobby

BUYING a Sinclair machine can be the start of a life-time's obsession with home computing. It is easy, however, to become discouraged if everything does not go according to plan from the beginning.

For those with only a little knowledge of computers and their capabilities, the best way to approach the machines is to abandon any ideas for special uses. While the 48K Spectrum is big enough for simple uses in small businesses, the range of Sinclair computers does not contain machines for major uses. It is better to become accustomed to the many facilities and then decide how you wish to use them.

Begin by unpacking your machine, overcoming your surprise at its size and weight and, following the manual, set up the system. If you cannot get the K on the screen, check that everything is plugged into its correct socket and re-set the machine by pulling-out the power plug for one second and try tuning-in again. If still nothing appears, check the power supply unit by shaking it. If it rattles, return it. If it is satisfactory, check your system with that of a friend.

If you have a Spectrum you will have received an introductory booklet which explains what the computer can do and giving detailed instructions on how to set it up. Also included is a fault-finding guide.

Once the K appears you are ready to begin learning about your machine. It can prevent family arguments if you can afford a separate television set for your system. It also makes life easier if you find somewhere to leave your equipment set up permanently. You will find that a few power sockets are needed and a four-way block connector on a short length of extension cable will help to tidy trailing leads.

When using a Spectrum, a television set has to be more finely-tuned than when using a ZX-81 because of the added dimension of colour. If the set is not tuned properly, the colours will look hazy instead of sharp and clear. If no colour can be seen when it is switched on, the power supply or the television set may be at fault.

Some users have experienced some difficulty with some television sets, which include Hitachi, Grundig and Toshiba. Sets which many people have found compatible include the Sony Trinitron, Fidelity and Ferguson.

The manuals are written in great detail and are reasonably easy to follow. Some of the chapters may not seem immediately relevant but it is worthwhile reading them as you might miss something important.

Patience is needed at that stage to learn the ways in which the computer will accept information. It is tempting to try to enter programs before you are ready but that is likely to lead to errors. For example, words like AND, THEN and AT should not be typed-in letter by letter.

By the time you have reached chapter 11 in the ZX-81 manual and chapter 19 in the Spectrum manual you should have accumulated sufficient knowledge to be

continued on page 92

continued from page 91

able to type-in other people's programs, such as those in *Sinclair User* and *Sinclair Programs*, without too much difficulty.

It is that important when using the ZX-81 that it is not jolted. Some of the connections can easily work loose and everything which has been entered will be lost.

The manuals are not to everyone's liking and if you find them difficult to follow a number of books on the market can help you. Find the one which suits you best.

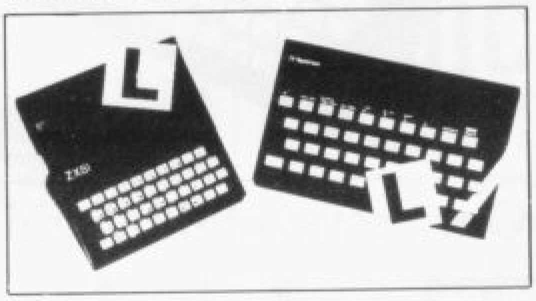
As a way of relaxing you can buy some of the growing range of commercially-produced software. That can be loaded directly from cassette but make sure that your machine is big enough to take the tapes you buy.

For the ZX-81 there are a few tapes for the unexpanded 1K machine but the majority require the 16K RAM pack. Similarly on the Spectrum most companies are taking advantage of the possibilities provided by the larger 48K machine rather than providing cassettes for the 16K.

The tapes can vary in quality and it is advisable to read the reviews in *Sinclair User* and use your judgment to find the best.

An alternative method to learn about both the ZX-81 and the Spectrum is to plunge in at the deep end and see what the machines will do. Refer to the manuals when you have difficulties. You can ignore the functions and calculations initially and experiment with PRINT statements to obtain the feel of the machines.

You may already have heard about the problem involved in SAVEing and



LOADing your own cassettes. The manual gives detailed instructions but many of the early ZX-81s would not accept tapes from some recorders. That problem is said to have been overcome but there can still be difficulties.

Usually they occur when LOADing tapes recorded by other people. One simple method to overcome this is to wind the tape to the middle of the program and type LOAD " " followed by NEWLINE; then increase the volume of the recorder slowly with the tape running until the television screen shows four or five thick black bands. If you then re-wind the tape, the program should LOAD normally.

LOADing and SAVEing on the Spectrum is much easier and faster than the ZX-81. One difference is that when SAVEing on the Spectrum the LOAD lead must be disconnected either at the recorder or the Spectrum.

Finally, a health warning. Apart from any practical uses, computing with your Sinclair machine can be a very entertaining hobby and is almost certainly habit-forming. You may easily find yourself crouched over your machine, red-eyed, in the early hours of the morning thinking that in another five minutes you will solve the problem. Try to break that habit by getting into the fresh air and meeting other Sinclair users.

By obtaining a Sinclair computer you find that you have joined a not very exclusive club with many thousands of members, many of whom would be only too happy to advise you if you have difficulties.

Make sure of your regular copies of *Sinclair User* and *Sinclair Programs* and you can be guaranteed many happy hours.



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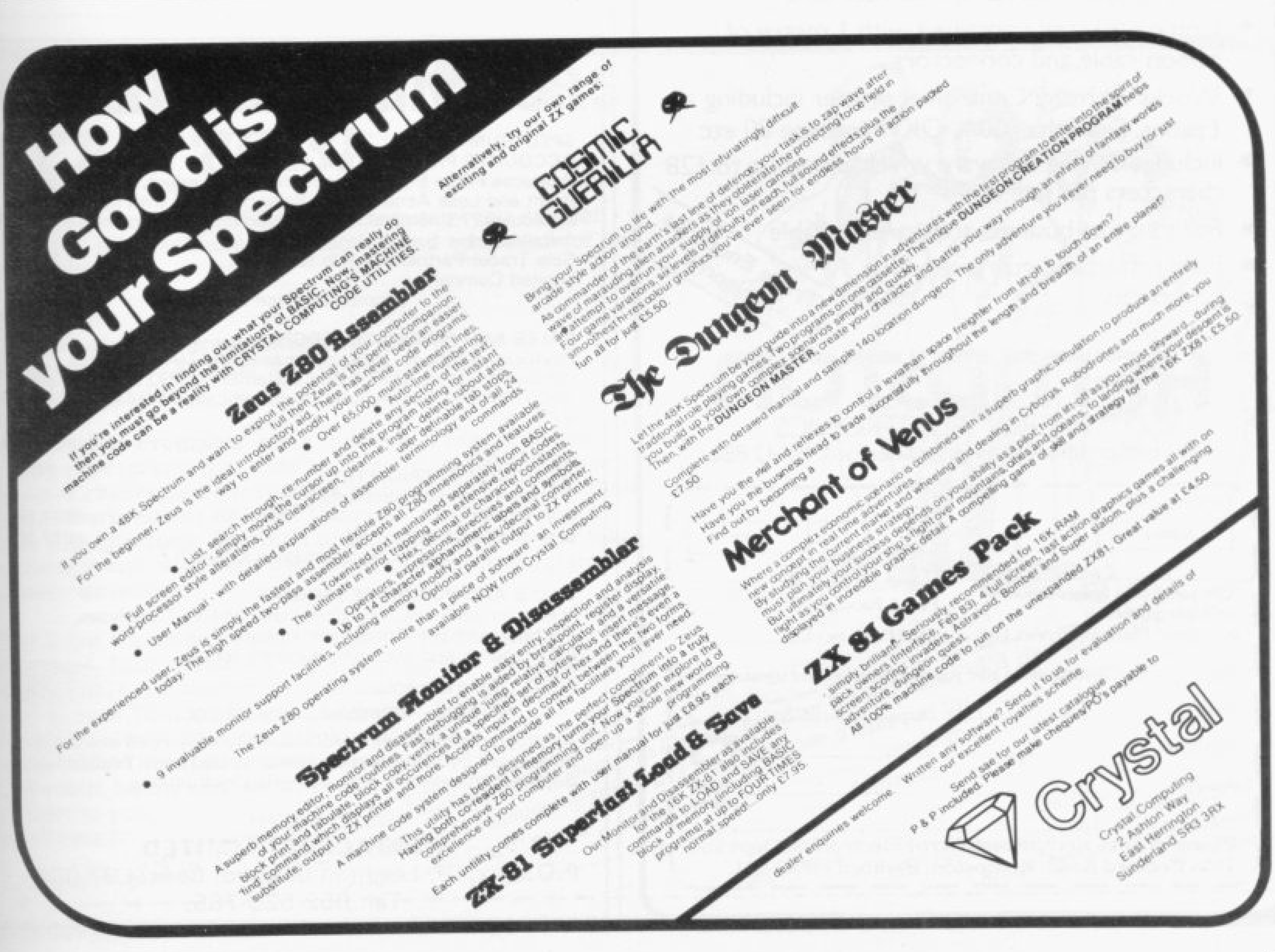
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Switching between complementary displays on the ZX-81

Queries on the way in which Sinclair machines use the screen continue to flood in. Andrew Hewson returns to the subject in his column this month with more routines for your programs

HAVING ANSWERED a number of questions about ZX-81 and Spectrum displays last month, I return to a similar theme. The first question is from Keith Ratcliffe of Stockport, who asks: **How can I switch rapidly between two different but complementary displays on my 16K ZX-81?**

As I explained last month, the display on the 16K ZX-81 occupies 793 bytes, starting at the address pointed to by the D-FILE system variable. Thus to save the current display and replace it by a new one it is necessary first to copy the current contents of the 793 bytes to a storage area, probably above RAMTOP, and then to copy the new display into place.

Table one shows a Basic program which demonstrates the principles of the procedure. It creates a display, copies it above RAMTOP, over-writes the display and then copies the original version back again. The loops in lines 10 to 50 and lines 210 to 250 are for demonstration purposes only.

Before using the program, RAMTOP must be re-set from its original value of 32768, which is the highest address available on the 16K ZX-81, to some lower figure so that the memory locations above it can be used to store the display information. The value of RAMTOP is determined by the contents of addresses 16388 and 16389 — see page 177 of ZX-81 Basic Programming.

The calculation used — all system addresses are calculated in an analogous fashion — is RAMTOP = Contents of 16388+256* Contents of 16389. Initially 16388 is set to 0 and 16389 is set to 128 because 0+256*128=32768.

The minimum requirement to store



● *Please address problems and queries to Andrew Hewson, Helpline, Graham Close, Blewbury, Oxfordshire.*

two complete pages is 793*2=1,586 bytes. That amount of space can be reserved, with some to spare, by entering POKE 16389,121.

Doing so re-sets RAMTOP to 0+256*121=30,976 and then entering NEW causes the ZX-81 to move the stack to take account of the new RAMTOP value.

The Basic program serves to demonstrate the technique but it is very slow and so I have given two machine code routines in table two, which together perform the same task. The routines both make use of LDIR, the machine code instruction for copying items from one area of memory to another.

The routines should be entered into a REM statement occupying the first line of a program starting at location 16516, using an assembler program or a simple hexadecimal loader such as:

```
10 REM AT LEAST 38 CHARAC-
TERS
20 FOR I=16516 TO 16551
30 INPUT Z$
40 POKE I,16*CODE Z$+CODE
Z$(2)-476
50 NEXT I
```

Before loading the routines, re-set RAMTOP and enter NEW as before.

Many display pages can be stored and recovered, provided RAMTOP is set low enough, using those routines. Their operation is controlled by the contents of locations 16514 and 16515, i.e., the first two locations of the REM statement. If the locations both contain zero the display is stored/recovered from the area immediately above RAMTOP. If the locations together contain 793 — the length of a single display page — 793 bytes is left between the RAMTOP and the beginning of the display storage.

The routine to store the display is located at 16516 and the recovery routine is at 16534. Thus, for example, to store and then recover a single page, enter:

POKE 16514,0
POKE 16515,0

'Two simple machine code loops could be used to transfer the data in a similar manner to the loops in table two — a reader exercise'

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```
RAND USR 16516      (store the page)
RAND USR 16534      (recall the page)
```

Similarly to store a second page and recover the first enter:

```
POKE 16514,25        (793-256*INT (793/256))
POKE 16515,3         (INT (793/256))
RAND USR 16516
POKE 16514,0
POKE 16515,0
RAND USR 16534
```

Similar routines can be written for the Spectrum but it must be borne in mind that the Spectrum display file is very large — nearly 7K when the colour information in the attributes is included. There is just sufficient room in the 16K machine to store one extra page and a small program. With 48K of RAM there is sufficient room for six extra display pages.

Richard Mellor of Walsall poses a question which does not concern the display file but the solution involves saving information above RAMTOP in a similar manner to storing the display. He asks: **Is it possible, on the ZX-81, to load and save variables only from within a program so that they can be loaded-in at a later date and re-used?**

```
 10 FOR I=0 TO 21
 20 FOR J=32 to 63
 30 PRINT CHR$ J;
 40 NEXT J
 50 NEXT I
100 LET D=PEEK 16396+256*PEEK
16397
105 LET R=PEEK 16388+256*PEEK
16389
110 FOR I=0 TO 792
120 POKE R+I,PEEK (D+I)
130 NEXT I
200 PRINT AT 0,0;
210 FOR I=0 TO 21
220 FOR J=63 TO 32 STEP -1
230 PRINT CHR$ J;
240 NEXT J
250 NEXT I
300 FOR I=0 TO 792
310 POKE D+I,PEEK (R+I)
320 NEXT I
```

Table 1. A ZX-81 program to demonstrate how to save a display above RAMTOP and retrieve it again. Before using the program enter:
POKE 16389,121
NEW

The ZX-81 LOAD and SAVE routines transfer to and from cassette all the information between address 16384 and the address held in the system variable called STKEND. Inspection of the memory map on page 171 of ZX-81 Basic Programming shows that most of the active contents of memory — the system variables, the program, the display and the variables and the like — lie between 16384 and STKEND. Hence those items are transferred automatically by the LOAD and SAVE commands.



It is unfortunate that the starting address is fixed at 16384. If it was determined by the contents of an extra system variable it would be possible, by POKEing suitable values into the system variable, to LOAD or SAVE portions of memory as can be done on the Spectrum. An alternative would be to copy the SAVE and LOAD routines into RAM, alter them and then use the new routines instead of the originals.

A simpler solution is to copy the contents of the memory area which is required separately — in this case the variables area — above RAMTOP, SAVE the program, copy the variables back again and then SAVE them separately. The reverse procedure is used when LOADing the program and the variables.

Supposing a two-dimensional array P(5,23) is to be SAVEd separately from the program. The first task is to determine how much memory is required in the variables area, and therefore also above RAMTOP, to store the array. It is possible to calculate the space requirements using the information in chapter 27 of ZX-81 Basic Programming but it is probably easier to let the machine do the work for you. First clear the ZX-81 by entering NEW and define the array by entering:

DIM P(5,23)

Then calculate the length of the variables area by checking the value of the two systems variables VARS — which points to the beginning of the area — and E-LINE — which points to one more than the end of the variables area. The difference between E-LINE and VARS less one, i.e. PEEK 16404+256*PEEK 16405-1-PEEK 16400-256*PEEK 16401 is the length of the variables area and, as the array P is the only variable, it is also the length of P. In this case P proves to be 583 bytes long — five bytes for each of the 5*23=115 elements of the array plus another eight bytes to hold various ancillary information as shown on page 173 of the manual.

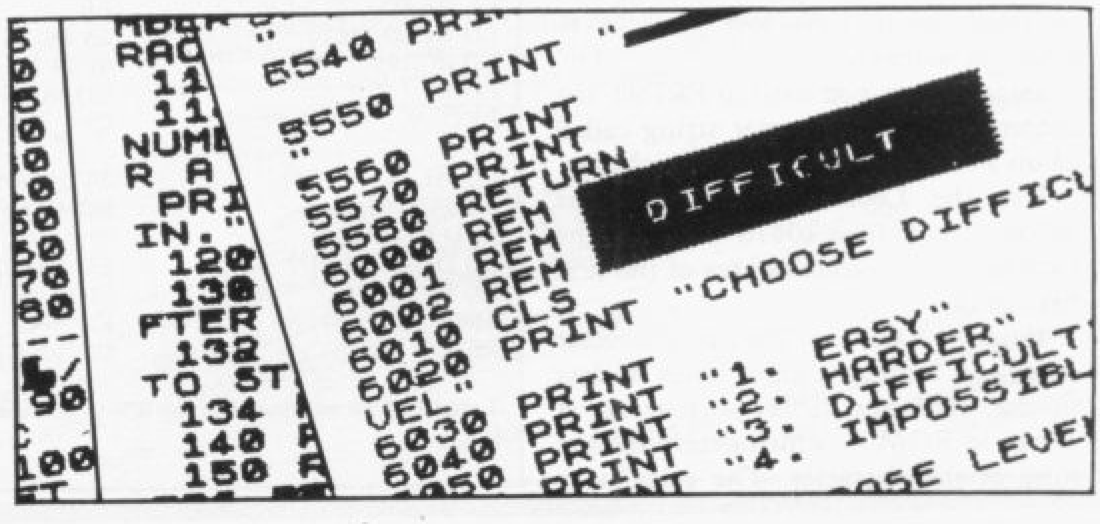
Thus at least 583 bytes of memory are required above RAMTOP to provide temporary storage for the array. Reducing the contents of 16389 from 128 to 125 reserves 3*256=768 bytes, hence enter POKE 16389,125 followed by NEW.

> 'Spectrum display file is nearly 7K when the colour information in the attributes is included'

The program can then be LOADed from cassette and the two routines listed in table three can be added to it. The two routines transfer the first 583 bytes of the variables area to and from the space above RAMTOP in much the same way as the display was transferred previously. There is one more requirement of the program. That is that the array must be the first variable declared by the program. That ensures that the array lies at the bottom of the variables area.

That final requirement makes it diffi-

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cult to use the technique with ordinary string variables because they can move up the variables area when they are redefined by the program. It is therefore best to use the technique only with numeric variables, arrays and string arrays.

Two simple machine code loops could be used to transfer the data in a similar manner to the loops in table two. That is left as an exercise for the reader.

My next letter is from Ulrich Myska of Berlin. He writes: **The advertisement for the Spectrum states that software can be used to generate 40 characters per line or more. Is there a simple Basic program which can do this?**

Unfortunately there is not. The Spectrum character set is designed on an

```
100 REM STORE P(5,23) ABOVE
    RAMTOP
110 LET I=PEEK 16400+256*PEEK
    16401
120 LET J=PEEK 16388+256*PEEK
    16389
130 FOR K=0 TO 582
140 POKE J+K,PEEK(I+K)
150 NEXT K
200 REM RECALL P(5,23) FROM
    ABOVE RAMTOP
210 LET I=PEEK 16400+256*PEEK
    16401
220 LET J=PEEK 16388+256*PEEK
    16389
230 FOR K=0 TO 582
240 POKE I+K,PEEK(J+K)
250 NEXT K
```

Table 3. Two ZX-81 routines to store an array p(5,23) above RAMTOP and to retrieve it.

eight-by-eight matrix of pixels giving a maximum of 32 characters on each of 25 lines, because the resolution of the screen is 192 by 256 pixels. I explained the somewhat complicated format of the Spectrum display last month, so I shall restrict my comments to an outline of how 40 characters per line might be obtained, given time and patience to write the software.

Imagine that you wish to PRINT the contents of a 40-character string called z$ on a single line. The steps might be:

Use the Lookvars routine in the ROM — at address 10418 — to find the location in the variables area of the first byte of z$.

Find the CODE of the first character in z$ and locate the eight bytes of data in the character table — starting at 15616 in ROM — which determine the form of the character. The calculation



is: Address of first byte = 15360+8*CODE(z$(1))

Store the contents of each of the eight bytes in the first, 33rd, 65th and the like bytes of the printer buffer starting at 23296. The printer buffer forms a useful temporary store and in this case it is exactly the correct length to store a single line of characters.

Find the CODE of the next character and the eight corresponding bytes in the character table as previously. Store the contents of the eight bytes in the second, 34th, 66th bytes of the printer buffer and then rotate each byte to the left by two bits. It is that procedure which will cause the characters to overlap so that 40 characters can be squeezed into the space normally used by 32. Repeat for the next character and rotate to the left by four bits.

You can see that the task is complicated but the difficulties do not end when all 40 characters have been transferred correctly to the printer buffer. Each line of 32 bytes must then be transferred to the correct position in the display file and, as I explained last month, that task is not straightforward.

Michael Boyd of Witham, Essex, wants to know how to write a program which can read two keys which have been pressed simultaneously. He writes: **I have tried using INKEYS but if two keys are pressed at the same time the result is zero, not the code of either key.**

The solution is to make use of the IN command as described in chapter 23 of the manual. There are eight versions of the command, each of which reads five of the 40 keys on the keyboard. The command returns a whole number between 224 and 225 inclusive, depending on which combination of five keys is pressed. For most programs it will be sufficient to test for each of the legiti-

> 'The printer buffer forms a useful temporary store and in this case it is the correct length'

mate results in turn. The most efficient way is to use a routine similar to the following:

```
100 LET I=IN 65022
110 PRINT I;
120 IF I=2*INT (I/2) THEN PRINT "A";
130 IF I=4*INT (I/4)<2 THEN PRINT "S";
140 IF I=8*INT (I/8)<4 THEN PRINT "D";
150 IF I=16*INT (I/16)<8 THEN PRINT
    "F";
160 IF I=32*INT (I/32)<16 THEN PRINT
    "G";
170 PRINT
180 PAUSE 99
190 GOTO 100
```

This routine uses the IN 65022 instruction to scan the five keys A, S, D, F, G.

Assembly code	Hexadecimal	Comment
		Store
LD HL,(RAMTOP)	2A 04 40	RAMTOP to HL
LD BC,(16514)	ED 4B 82 40	Offset to BC
ADD HL,BC	09	Add
EX DE,HL	EB	Destination to DE
LD HL,(D-FILE)	2A OC 40	Source to HL
LD BC,793	01 19 03	Length of display to BC
LDIR	ED BO	Block move DE to HL
RET	C9	End
		Recover
LD HL,(RAMTOP)	2A 04 40	RAMTOP to HL
LD BC,(16514)	ED 4B 82 40	Offset to BC
ADD HL,BC	09	Add
LD DE,(D-FILE)	ED 5B OC 40	Destination to DE
LD BC,793	01 19 03	Length of display to BC
LDIR	ED BO	Block move DE to HL
RET	C9	End

Table 2. Two routines for the ZX-81 to store a display page above RAMTOP and recover it.

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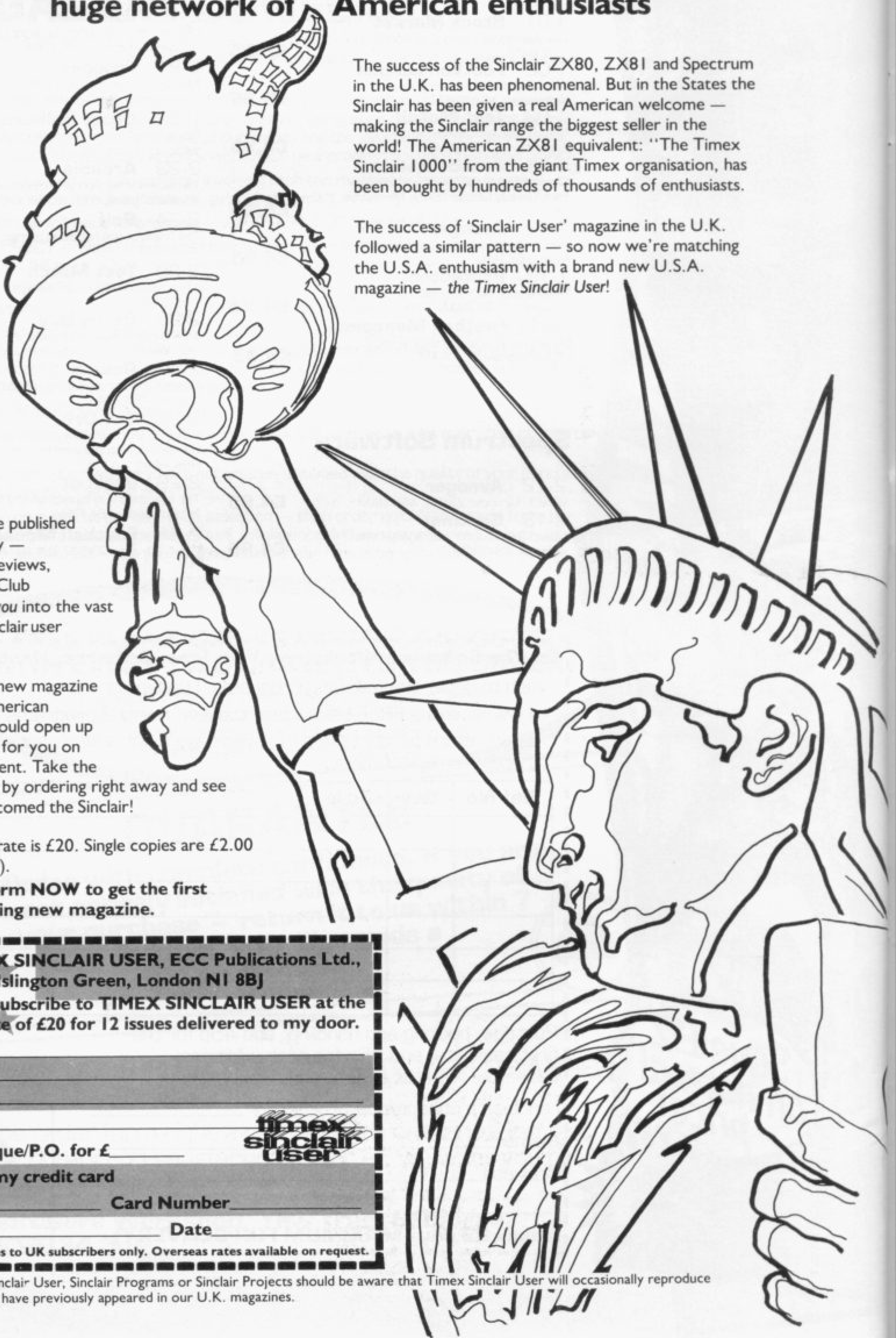
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Checking the best moves in the growing chess market

Quentin Heath emerges from the dungeons to return to the boards

IN THE LAST few months I have been stuck underground in the *Sinclair User* dungeons with a variety of man-eating monsters, so this month I thought I would seek some fresh air and talk about chess.

In later articles I want to say something about the structure of chess programs but for now I will introduce you to what is available for Sinclair machines.

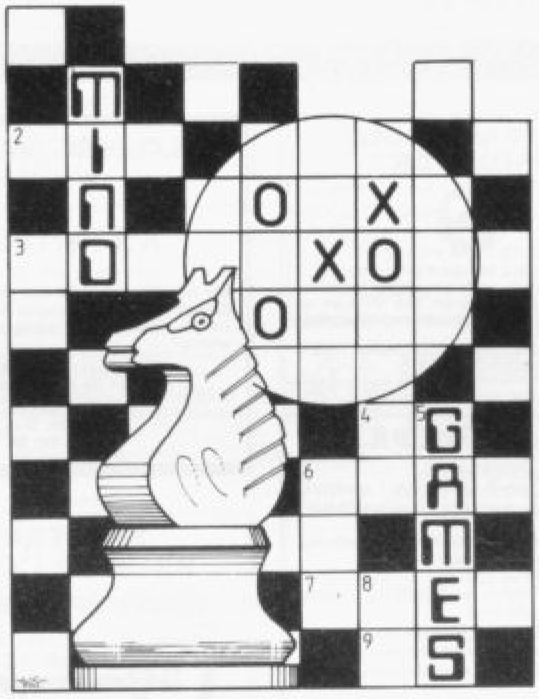
Most of the early ZX-81 games were, more or less, copies of a famous American chess program called **Sargon.** Many manufacturers used the Sargon basic structure and re-wrote the printing routines so that they would be compatible for the ZX-81 screen format.

After a few months of copying, manufacturers began to alter programs to make them play better and run faster. Out of the first batch of games to arrive on the scene, the Artic Computing **ZX-81 Chess** was acclaimed the best by the critics.

The original Artic chess, and its upgraded version, **Chess Two,** have sold well and with good reason. The games include all legal moves, with castling and *en passant,* and can be played at six levels. The easiest level has a response time of about one second and the most difficult, level six, takes several minutes to make a move.

Chess Two plays a good entertaining game for anyone with a slight knowledge of the laws of chess and when I played with it the game did not make an incorrect move, even on the simplest level. It is the game I would recommend for the average player who wants to try to beat a computer at chess. Some people may argue that a computer can play only a mechanical game with no invention or luck but playing a computer will give you some practice if no partner is available.

Artic also produces a technically-excellent game which fits into the 1K ZX-81. It may not play brilliantly but it is fascinating to watch the computer scan the moves available to it graphically on the screen. The computer makes moves very quickly, although it will not allow



the usual *en passant* and castling which are available on the bigger games. The game loads very quickly and at £2.95 it is worth the money.

Artic has upgraded its ZX-81 chess games to the Spectrum. There are at present three versions but only one is for the 16K Spectrum. So far as I know it is the only chess program for the 16K machine. Its playing standard is similar to that of ZX Chess Two.

The most interesting of the chess programs from Artic is **Voice Chess.** It not only plays as well as **Spec Chess,** the other game in the trio, but each move made is announced by a voice which is generated by the Spectrum loudspeaker.

Some people have asked if the amount of memory used to store the voice affects the quality of the game. So far as I can tell, it does not do so noticeably. Most chess programs occupy a great deal less room than 48K and the voice is just filling the space which is not used. My own feeling is that if you want a game with novelty you should buy Voice Chess but if you just want to buy a good game with no frills, 48K Spec Chess and 16K Micro Chess are choices.

Master Chess, from Mikro-Gen, also provides a formidable game. It runs on a 48K Spectrum and has 10 levels of play which are numbered from zero to nine. If you do not know which move to make the computer will suggest one for you. The game also includes an analysis option which can be used to solve chess puzzles.

The Masterchess program is capable of all legal moves, including *en passant* and castling.

To see how the games compete with a real chess machine I played a game between the Quicksilva Chess Player and a Sci-Sys chess computer. The results were interesting. Sci-Sys was slower in making moves than the Quicksilva game on level one but the dedicated chess computer earned checkmate in 67 moves.

What was also interesting was that the Sci-Sys system often anticipated the moves of the Chess Player. That may indicate that most structures are similar.

The final game I want to examine is the best available, in my opinion. **Superchess Two** is from CP Software and is a chess player's dream. The range of options includes 10 levels of play, a recommended move option, self-play, analyse and technical information.

The self-play mode pits the computer against itself so that you can see how it solves game problems. You can also provide it with problems to analyse and solve.

The most advanced level is level 10. At that level the computer can take several hours to make up its mind about a move.

The game also includes an option which I have never seen in other chess programs. The technical information option will tell you how the program is structured and which techniques are used for the computer to find its next feasible move. Explanations of tree searches and data structures is provided to give the player a chance to further the computer's 'mind'.

If you have views on any mind games or if you have hints and tips on adventure games, computer-moderated games, chess, or anything along those lines, you can contact me. I will also try to answer questions which you may have. The address is:

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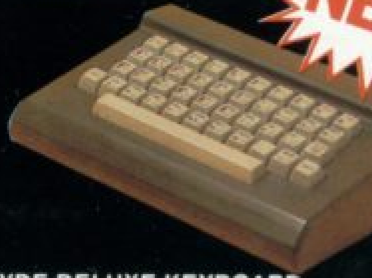
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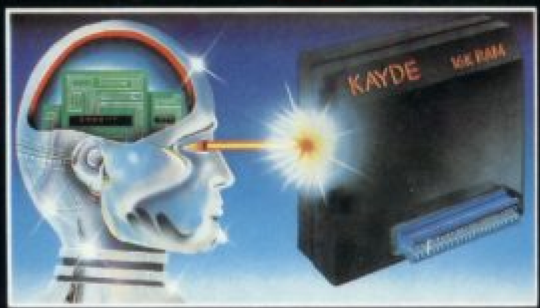
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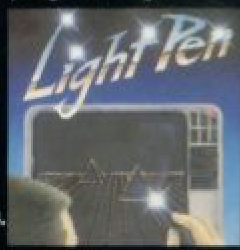
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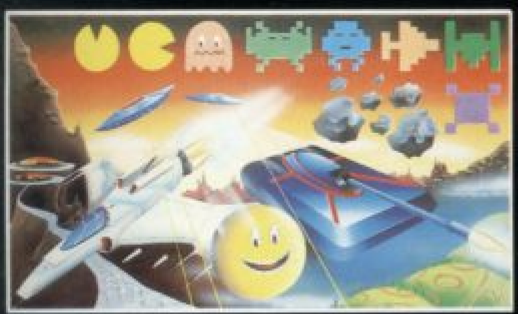


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